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AN ANALYSIS OF THE ABANDONED AUTOMOBILE PROBLEM

Booz-Allen Applied Research, Inc.

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AN ANALYSIS OF THE ABANDONED AUTOMOBILE PROBLEM

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Bethesda, Maryland

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Cincinnati, Ohio 45268

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This study was initiated in June 1971 to quantify the flow of out-of-service autos through the automotive scrap cycle and tc evaluate and recommend strategies to mitigate the abandoned auto problem. Characteristics of and impediments in the auto cycle were described and a quantification of the problem was given. Guidelines for ordinances to aid in solving the abandoned automobile problem and a dynamic model of the automobile out-of-service cycle were discussed. Appendixes included a bibliography, surveys and results, a study plan, and a quantification of statistical data.

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FOREWORD

Man and his environment must be protected from the adverse effects of pesticides, radiation, noise and other forms of pollution, and the unwise management of solid waste. Efforts to protect the environment require a focus that recognizes the interplay between the components of our physical environment--air, water, and land. The National Environmental Research Centers provide this multidisciplinary focus through programs engaged in

- studies on the effects of environmental contaminants on man and the biosphere, and
- a search for ways to prevent contamination and to recycle valuable resources.

In an attempt to solve the problem of solid waste disposal, the study described here was undertaken to investigate the flow of out-of-service autos through the automotive cycle. After evaluating the problem, strategies were recommended to alleviate the abandoned auto problem.

A. W. Breidenbach, Ph.D
Director
National Environmental
Research Center, Cincinnati

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I. INTRODUCTION

In the past several years there has been a growing awareness of the pervasive role of the automobile in U.S. life and the implications of this phenomena on the quality of our environment. One aspect of this phenomena is the abandoned automobile problem. This study, conducted by Booz, Allen Applied Research, Inc. (BAARINC) and sponsored by the Environmental Protection Agency (EPA), focuses on this problem.

While a well-established economic cycle exists for the reclamation of the material resources of automobiles that have reached the end of their useful life, this cycle has basic inefficiencies. As a result, automobile hulks have been accumulating in substantial quantities since the middle of the 1950's. This accumulation is objectionable in that it represents an unused resource. But perhaps of more immediate concern, abandoned automobiles are an aesthetic blight on our environment. The abandoned auto problem has higher public visibility than most other solid waste problems, since the automobile hulks are accumulating in small quantities at a myriad of automobile graveyards throughout the country.

In the past five years, a number of significant studies of the abandoned automobile problem and related studies of the scrap cycle have been conducted. To put the problem in perspective, these studies are summarized below in a concise format including the objectives, scope, and results of each.

(1) Iron & Steel Scrap: Consumption Problems, By Gardner F. Derrickson; U.S. Department of Commerce, Business and Defense Services Administration, March, 1966. (52 pages)

Objectives: "To identify iron and steel scrap consumption problems and to seek means of solving them."

Scope: Description and analysis of scrap industry characteristics with some emphasis on automobile scrap.

Results: The report concludes that:

- "There is no basic problem with respect to the movement of originated, acceptable iron and steel scrap through trade channels into consumption by steel plants and foundries . . . ."
- "There is, however, a problem with respect to using the full amount of originated scrap of limited acceptability, that is #2 bundles and similar scrap containing undesirable quantities of non-ferrous materials."
- Accumulations of junk autos in salvage yards . . . . and abandoned autos . . . is fundamentally an aesthetic, rather than a scrap, problem."

(2) Automobile Disposal—A National Problem: U.S. Department of the Interior, Staff of the Bureau of Mines; Washington, D. C., 1967.(569 pages)

Objectives: "A fact-finding survey of the auto wrecking industry, the ferrous scrap processing industry, and other elements in the automotive scrap situation. The primary objective was to identify the factors that influence the accumulation of automobile scrap."

Scope: Case studies of 54 districts selected as representative of 6 basic types of areas were conducted. Interviews with 186 scrap processors and 1,075 auto wreckers were conducted. In addition, police and other local officials were interviewed.

Results: The sum of the statistical sample developed represented a population of almost 16 million, automobile registrations of 6.4 million, over 1,000 auto wreckers, and a junk car inventory of 510,000 including 106,000 outside the industrial flow. A list of 80 factors was compiled, which influence the movement of automotive scrap. Different factors are more important in one area than another and no attempt was made to determine cause and effect insofar as automobile disposal is concerned.

The study concluded that, "On the whole, there appears to be an adequate market for automotive scrap if price and quality competition is met." This massive document serves as a valuable statistical source book. The results did not focus specifically on the abandonment problem.

(3) The Automobile Cycle: An Environmental and Resource Reclamation Problem: U.S. Department of Health, Education and Welfare, Bureau of Solid Waste Management; Washington, D. C. 1970 (53 pages)

Objectives: To analyze the automobile scrap cycle and evaluate possible tactics and strategies to improve it.

Scope: Compiled data from existing sources (previous government reports, industry statistics, etc.). Dealt with a much broader problem than abandoned autos. In seeking to improve the flow of scrap, primary goals were to minimize environmental damage, conserve natural resources, minimize economic disruption, and simplify administrative procedures.

Results: Concluded that the following automobile-recycling problems exist:

- Abandonment of vehicles on public and private property
- The ratio of dismantler inventories to throughput is excessive

- The steel mill and foundry industries do not utilize all the automotive scrap available because it frequently is of lower quality than other sources of scrap.

Presented and discussed the merits of four basic tactics to combat the above problems. Both positive and negative economic incentives were considered, and further classified according to revenue sources and uses. Regulatory actions were analyzed, including fines, regulations on new automobile composition, quotas on natural resources and hulk inventories, and freight rates. Public information and training programs were considered, and finally research and development to improve the processes involved in automotive scrap recycling.

(4) Junk Car Disposal: National Industrial Pollution Control Council, Sub-Council Report; for the Secretary of Commerce: October, 1970. (54 pages)

Objectives: An information paper for both industry and government about the number and location of junk cars to permit long-term planning of economic means for their disposal.

Scope: An overview of previously collected data along with Appendices containing:

- New Hampshire Law on Motor Vehicle Junk Yards
- Suggested State Legislation from Council on State Governments
- GMC news release on the use of Reconstituted Steel
- Bulk transport of Crushed Automobile Bodies on Rail Cars--Southern Pacific Transportation Co.

- Speech of Representative Charles E. Chamberlain "Junkyards: Disguise or Dispose?"

Results: The study reached the following conclusions:

- There is an almost complete lack of authoritative statistical data on the size of the problem
- The aesthetic aspects of the problem are easily amenable to solution
- The economic aspect is capable of solution and is being at least partially solved by industry
- State or local government action is required to expedite title clearance and prohibit accumulations of junk cars.

(5) Automobile Scrapping Processes and Needs for Maryland: By Management Technology Inc., for the Maryland State Department of Health: U.S. Public Health Service Publication No. 2027, 1970. (63 pages)

Objectives: Identify and recommend solutions to the automotive scrap cycle problem of the State of Maryland.

Scope: Questionnaires to officials in all counties of Maryland and the City of Baltimore to assess the magnitude of the junk automobile problem in Maryland.

Results: Final recommendations encompassed the complete automobile scrap cycle in Maryland. In the area of automobile abandonment, recommended the following:

- Heavy legislated penalties for abandonment, since private sector actions cannot reduce auto abandonments

- Pass laws defining abandoned autos as a public nuisance, to expedite the collection of these vehicles and their processing by soon to be installed shredders in Baltimore.

(6) What Wisconsin Can Do to Get Rid of Junk Cars: By Duncan A. Harkin and Warren K. Porter of the University of Wisconsin Extension for the Wisconsin Natural Beauty Council, August, 1970. (68 pages)

Objectives: To solve the problem of the "ugliness of auto graveyards."

Scope: Considered four basic types of solutions to Wisconsin's problems:

- Change title clearance procedures--easier to scrap a car
- Financial incentives to increase portion of cars in the scrap cycle: (i) Maryland Plan; (ii) Vermont Plan
- Deposit of a car disposal fee
- Financial incentives to private sector for investment in processing equipment.

Results: Recommended Vermont type plan as primary strategy for Wisconsin.

(7) Report on Discarded Motor Vehicles: Committee on Discarded Vehicles; Richmond, Virginia, August 27, 1970. (24 pages)

Objectives: "A solution to the problem of the accumulation of discarded vehicles"—"blot on our landscape and the conservation of a vital resource."

Scope: State of Virginia.

Results: Recommended the establishment of automobile disposal sites, with the state to contract for removal from such disposal sites. Removal costs would be funded by the addition of a $2.00 charge to the title fee. Also recommended a twelve month residence time limit for seven year old cars.

(8) Disposal of Junked and Abandoned Motor Vehicles: Hearings on Bills S. 4197 and S. 4204 before the Subcommittee on Air and Water Pollution of the Committee on Public Works, United States Senate, August 19 and 26, 1970. (416 pages)

The best recent overview of activities aimed at the solution of the abandoned auto problem. Contains studies (3), (6), and (7) cited above, along with the testimony of experts and the following major documents:

- Proceedings of the National Conference on the Abandoned Automobile - LANDSCAPE 1970
- Preliminary Draft--The Auto Wrecking/Dismantling Industry: U.S. Dept. of Commerce--see (9) below, which is essentially the same report, prepared by Edward W. Hassell.

(9) Auto Wrecking Industry Report: SCRAP AGE MAGAZINE, February, 1970. (pp. 206-267)

Objectives: To study the auto wrecking industry; its activities, problems, and impact on the environment.

Scope: Questionnaires from 1,100 auto wreckers, about 7 percent of the national total.

Results: Detailed statistical characterization of auto wrecker's economics, attitudes, and operating procedures.

(10) Motor Vehicle Abandonment in U.S. Urban Areas: By Gardner F. Derrickson; U.S. Department of Commerce, Business and Defense Services Administration, March, 1967. (51 pages)

Objectives: "To provide empirical information on the extent of motor vehicle abandonment in urban areas... and to evaluate the adequacy of present methods of handling the abandonment problem."

Scope: Three hundred ninety-five questionnaires to cities of 50,000+ : 268 useful returns. Population of 57 million represented.

Results: Statistical table characterizing the problem as viewed by local officials. Suggested state legislation.

A complete bibliography of studies of the abandoned auto problem and the automobile scrap cycle is given in Appendix A. Although the list of background studies is long, substantial gaps exist, including the following:

- Accurate background data and strategy development tends to have local focus: (1), (4), (5), and (6)
- National data related to quantification of the problem displays substantial uncertainty bands for values of key parameters (2), (8), (9), and (10)
- The amount of direct new data gathering is low, with much of the same data repeated from one report to the next
- Reports tend to focus very broadly on scrap cycle factors, but lack incisive focus on the automobile abandonment problem (1), (2), (3), and (7)
- Reports tend to view the problem on the basis of data gathered from specific elements in the scrap cycle: local governments, wreckers, and scrap processors (4), (8), (9), and (10).

Although a wealth of data has been published and republished, key elements involving motivation, economics, and trends at the critical entry point into the cycle are still missing. Although strategies are presented to alleviate the problem, the proposals suffer from two major shortcomings:

- Broad indirect strategies have not been analyzed to determine specific results on automobile abandonment
- Direct strategies proposed generally have lacked sound analytical and economic justification. This is the result of a lack of key data.

Thus, although an apparently substantial set of background data existed in the abandoned automobile area, key data elements are missing. In addition, there was strong evidence that the abandonment problem was increasing in magnitude. The EPA required specific support in developing a program to combat automobile abandonment and facilitate removal of the present auto graveyard inventory. It was with this background in mind that the EPA initiated this study through Booz, Allen in June, 1971. A summary of work statement elements and study results is given in the next section.

II. SUMMARY OF RESULTS AND CONCLUSIONS

This study was initiated in June 1971 to quantify the flow of out-of-service autos through the automotive scrap cycle and to evaluate and recommend strategies to mitigate the abandoned auto problem. The results and conclusions are presented under the following headings:

- Quantification of the problem
- Characteristics of the auto scrap cycle
- Strategy evaluation and recommendations
- Legislative guidelines.

1. QUANTIFICATION OF THE PROBLEM

(1) Vehicles Out-of-Service and Unprocessed

Data on the number of automotive vehicles which go out of service each year is compiled by Wards Automotive. The results for the years 1958-1970 are shown as the bars in Figure II-1. A procedure was developed to estimate the number of automotive vehicles which are processed into scrap each year, based upon total scrap processed. (See Appendix C for the detailed quantification methodology.) The high and low range of this estimate is also shown by year in Figure II-1. The difference between the out-of-service vehicles and the processed vehicles is shown in Figure II-2 as a range of unprocessed vehicles. This range is from a minimum of 8 million vehicles to a maximum of 20 million vehicles. A best estimate of the accumulation of unprocessed vehicles from 1958 to 1970 is 12.7 million, based upon the average of the estimates (less an estimated scrap processor inventory of 360,000 autos).

To validate this estimate from other data, results of the Maryland study (ref. 30) and the Bureau of Mines study (ref. 2) have been extrapolated to the national level with the following results for 1967 (indicated on Figure II-2):

FIGURE II-1
Summary of Annual Out-of-Service
Vehicles Compared With Estimates of
Vehicles Processed into Scrap

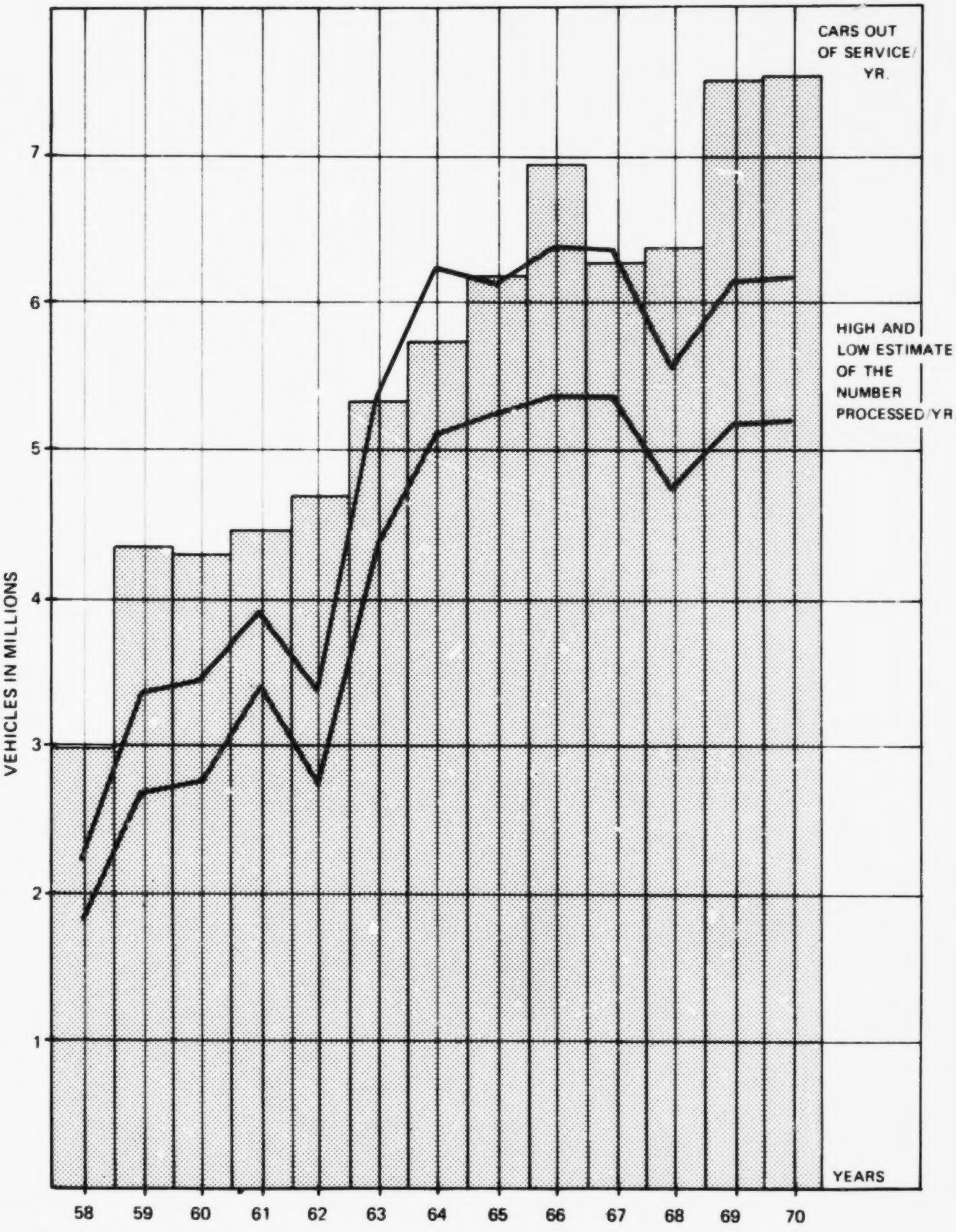
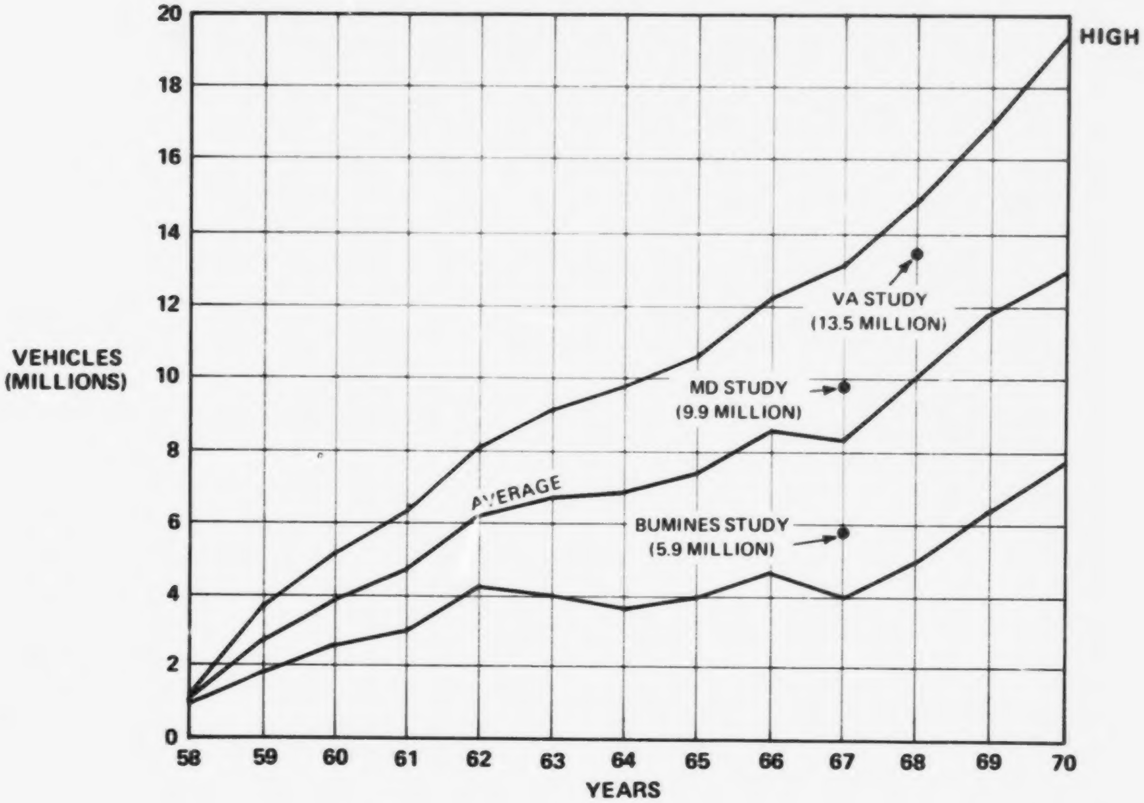


FIGURE II-2
Unprocessed Vehicles - 1958 to 1970



- Maryland study - 9.9 million
- Bureau of Mines study - 5.9 million.

In addition an estimate of 12.44 million unprocessed vehicles (1970) has been made in a study sponsored by the Mobile Crushers Corporation of America.

(2) Number and Capacity of Auto Wrecking Firms

The number of auto wreckers has been estimated to be 22,127 based on data collected from 11 states and extrapolated to a national average. It was found that auto wreckers in urban areas are space limited in their capacity to accept vehicles. Wreckers in urban and rural areas are dependent on the used parts market in their ability to accept vehicles. Auto wrecker inventories are estimated at about 78% of the unprocessed vehicles or approximately 9.9 million autos.

(3) Number and Capacity of Scrap Processors

There are approximately 3,500 scrap processors in the United States, 1,200 of whom possess most of the processing equipment and account for over 90 percent of the scrap processed. Based on a 40-hour work week, scrap processors have the capacity to process approximately 53 million tons of scrap which exceeds the 1969 consumption rate by 7 million tons. The 53 million ton capacity could be substantially increased by adding a second shift to the industry. Scrap processors maintain a minimum inventory of auto hulks, estimated at about 6 percent of their annual throughput or about 350,000 in 1970.

(4) Abandonment Rates

In urban areas, abandonment rates vary from 0.1 percent to 1 percent of the vehicles registered. The higher rates are associated with the large cities where vehicle densities approximate 1.4 vehicles per unit of population. The lower range is associated with cities of vehicle density of 0.4 to 0.6. New York City has an annual abandonment rate of approximately

80,000 vehicles and Washington, D.C., 10,000 vehicles. However, these abandoned vehicles are nearly all collected promptly by municipal authorities or private companies under contract to the cities, and, because of the proximity to scrap processing yards, all rapidly enter the scrap cycle. In rural areas, the accumulation of abandoned vehicles is more serious. If the average national abandonment rate is somewhere between 0.4 percent and 0.7 percent, this would be 300,000 to 600,000 vehicles.

(5) Trends in Vehicle Abandonment

Figure II-1 shows that even using the upper bound of the vehicles processed into scrap, only in the years 1964 and 1967, did the processed vehicles exceed the number of out-of-service vehicles. Thus the backlog is continually building. Furthermore, the abandonment rate in major urban areas increases each year. Abandonments in New York City have increased from 2,500 in 1960 to 65,000 in 1970, while in Chicago the number has increased from 29,000 to about 100,000 in the same period. Thus, it is apparent that this problem is one which will not disappear, but rather will become more severe with time, unless some drastic unforeseen change should occur in scrap demand.

The above has been verified using a simple dynamic model developed in this study and presented in Chapter VI. The dynamic model indicates that prior to 1955 the problem of automobile scrap inventory build-up was relatively minor. The results strongly indicate an acceleration in automobile abandonments beginning in the mid-1960's and continuing today. Thus, the problem will not go away given present trends in automobile ownership and disposal patterns. Action to alleviate the problem is clearly justified.

2. CHARACTERISTICS OF THE AUTO SCRAP CYCLE

(1) Vehicle Owners

Vehicles are abandoned for the following primary reasons:

- Economics of disposal
- Ignorance of disposal procedures
- Loss of lien or title
- Stolen.

Other than stolen vehicles which can be restored to their owner, the remaining reasons indicate that the problem reflects individual attitudes and an almost total lack of enforcement of existing laws against abandonment or littering.

(2) Auto Wreckers

The auto wreckers characteristics and requirements can be summarized as follows:

- Primarily in auto parts business and prefer autos less than seven years old
- High collection costs limit distance wrecker will go to collect cars and make him increasingly dependent upon independent collectors
- Are space, rather than market motivated, in making decisions to dispose of hulks
- Affected by bans on open burning but gross sales of scrap do not warrant investment in incinerators
- Low scrap prices are responsible for accumulations in auto wrecking yards.

(3) Scrap Processors

The scrap processor's characteristics and requirements are summarized as follows:

- A major impediment to flow of auto hulks to scrap processors is transportation cost. Use of mobile car crushers tends to alleviate this problem.
- Ban on open burning impedes flow of auto scrap to scrap processor operations, unless he has a shredder.
- Baled scrap is of lesser quality than shredded scrap (which separates out the non-ferrous portion) and therefore has reduced demand in periods of reduced steel production.

- Automobile scrap accounts for only about 4 percent of all ferrous scrap
- Capacity of scrap processors is considerably in excess of the current processing rate and represents no impediment to the flow of out-of-service vehicles.

(4) State and Local Officials

The requirements and characteristics of the problem as viewed by state and local officials are as follows:

- Nearly all cities have abandoned auto ordinances — either sanitation or motor vehicle codes
- Penalties do not act as a deterrent, abandoners seldom are caught
- About 1/4 of cities surveyed provide disposal sites for auto retirement
- Major cities such as New York and Chicago have essentially solved abandoned auto collection problems at a relatively low cost
- Abandonment in rural areas is the major problem. Abandonment is predominantly on private property.
- Four states responding to the survey (Maryland, Minnesota, Vermont, and Virginia) have or proposed to have a state program for dealing with abandoned autos.

(5) Steel Users

The three main users of automotive scrap are the U. S. steel industry, the iron and steel foundry industry and the export market. Their general characteristics and requirements for scrap are as follows:

- The steel industry constitutes the major consumer of obsolete automotive scrap

- Steel mills, except those operating electric furnaces exclusively, currently have extensive capitol investments in coal and iron ore mines thus committing them to virgin ore intensive steel production

- The upper limit of scrap utilization in open hearth furnaces is approximately 40 percent, in basic oxygen furnaces approximately 30 percent; in electric furnaces approximately 98 percent

- Steel industry generally uses mill-generated scrap before purchasing scrap from scrap processors

- Contaminant levels in automotive scrap are of critical importance to the steel making process.

3. STRATEGY EVALUATION AND RECOMMENDATIONS

Strategy development and evaluation is discussed in detail in Chapter V of this report. Strategies to mitigate the problem are considered in two broad categories:

- Direct actions
- Indirect actions

Direct actions are designed to prevent abandonment or to facilitate removal, but no single strategy does both. Direct actions to prevent abandonment are those which motivate the owner to responsibly dispose of his vehicle when it no longer has sufficient intrinsic economic value to be sold. Indirect actions primarily involve incentives in the scrap cycle to encourage the collection and processing of hulks. All of the indirect strategies considered are so far removed from the problem of automobile abandonment that they are not recommended in response to this problem, although some of them merit consideration for increasing overall recycling of steel scrap.

To prevent abandonment, the two most effective strategies considered are:

- Require a $25-50 deposit on all registered vehicles, to be refunded when and if the owner ceases to own a vehicle

- Require that an owner provide satisfactory proof of vehicle disposal (or pay a substantial fine) before being allowed to register another vehicle.

The latter is recommended over the former on the basis of consumer costs. The deposit program in effect increases the cost of an auto to the consumer by the value of the deposit. This is its basic intent, i.e., to make the value of a hulk sufficiently high so that an owner will not abandon it, or if abandoned a wrecker will seek to collect it. The disposal certification, on the other hand, uses an effective club over most consumers, while not burdening the entire driving public with the cost of a deposit.

Implementation of the disposal certification strategy requires action within each state motor vehicle bureau. However, there are a number of potential problems inherent in any such proposal which requires a new action by all vehicle owners in a state. It is therefore recommended that a three year pilot program first be initiated in one state to determine the most effective administrative procedures for handling these problems. The basic functioning of the certification process is described in Chapter VI.

To facilitate removal, different strategies are required for urban and rural areas. In urban areas, contracts with local wreckers are recommended to collect and dispose of all abandoned vehicles. In addition, state and local ordinances to facilitate this process are recommended by easing title and transfer requirements. In rural areas, state transportation subsidies are recommended to facilitate the removal of collected hulks to a scrap processor.

In summary, the abandonment problem is under control in most large urban areas. More rigid enforcement based on a requirement for disposal certification is recommended. Abandoned vehicle collection is recommended for rural areas because of the low vehicle density and great distance from scrap processors. Transportation subsidies are recommended as the lowest cost option to collect these vehicles.

4. LEGISLATIVE GUIDELINES

Guidelines to assist state and local governments implement the recommendations of this report are presented as follows:

- Uniform Titling Law - recommended as developed by the National Committee on Uniform Traffic Laws and Ordinances

- State Legislation on Handling of Abandoned Vehicles - several improvements recommended to the model ordinance developed by the Council of State Governments
- Enabling Legislation for Urban Vehicle Collection - recommendations made concerning basic features desirable
- Assistance in Rural Vehicle Collection - recommendations made following the basic plan developed by the State of Vermont
- Disposal Certification - recommendations presented for development of state legislation requiring proof of vehicle disposal before another vehicle can be licensed in that state.

III. CHARACTERISTICS OF, AND IMPEDIMENTS IN, THE AUTO SCRAP CYCLE

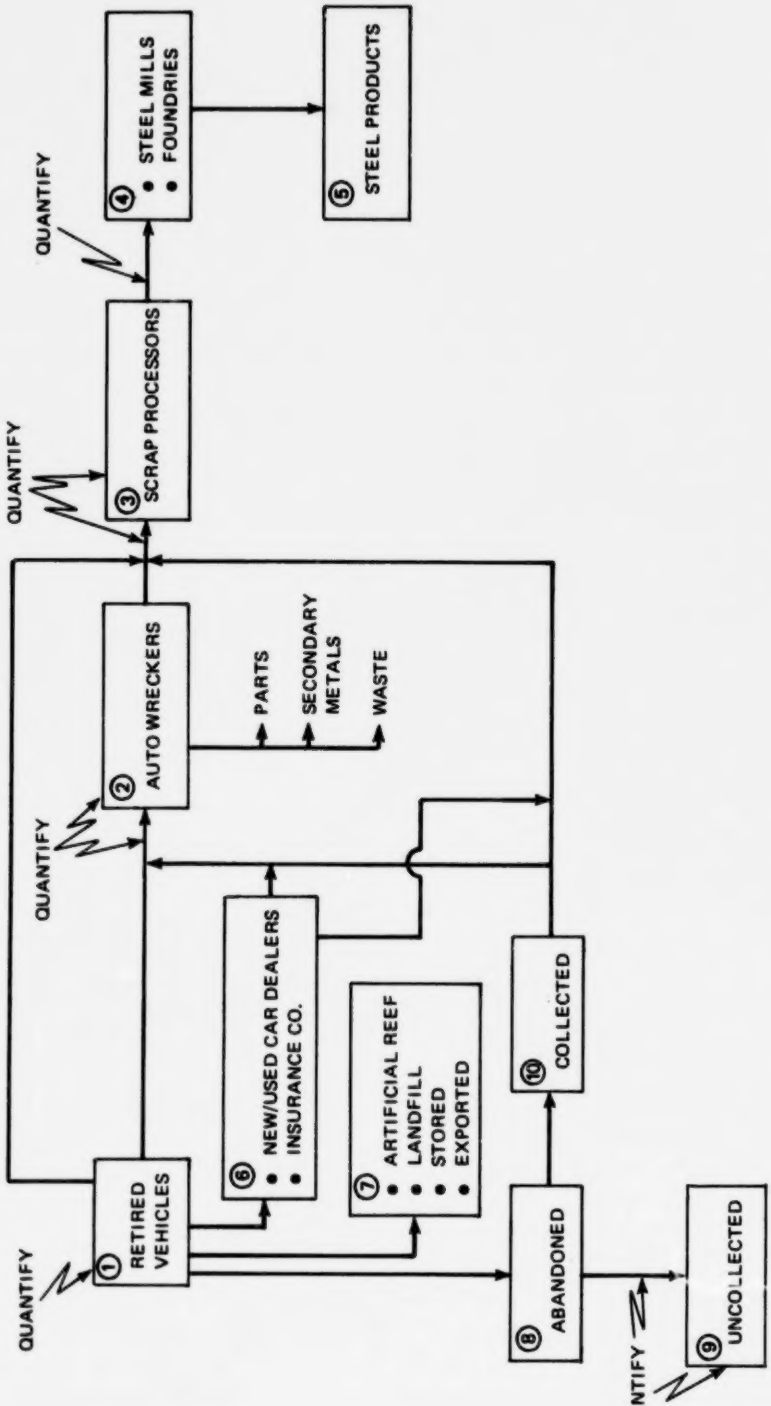
The basic elements of the auto scrap cycle are shown in Figure III-1. Block (1) shows vehicles retired from operational use, most of which flow directly to auto wreckers (2) for parts sales or to scrap processors (3) for their scrap value. A very small number frequently remain on the private property of the owner for a variety of purposes. Low value trade-in vehicles will frequently be scrapped by new or used dealers (6) and vehicles involved in accidents will often enter the scrap cycle via insurance companies (6). A very small number have been used experimentally for artificial reefs or other miscellaneous purposes (7). Of these abandoned on public or private property (8), many are collected (10) by state or local authorities because they constitute a traffic hazard or nuisance, and delivered to auto wreckers or scrap processors. Some are uncollected (9) primarily because they do not constitute an immediate hazard and no municiple authority is willing or able to bear the expense of removal. The ultimate market for all ferrous scrap is the steel mills and foundries (4) which use it to varying degrees in steel making.

This study is concerned with the problem of abandoned vehicles, but from the nature of the flow process described above, it is apparent that all of the entities in the scrap cycle should be considered in analyzing the problem. Each of the entities is described in this chapter, based upon past studies, interviews, and a series of surveys conducted as a part of this study.

1. AUTO WRECKING INDUSTRY

The auto wrecking industry is the first processing point in the industrial cycle. It is at this point where vehicles are stripped for parts and high value secondary metals, with the frames and sheet-metal bodies continuing through scrap processors' yards to the steel mills and foundries. Analysis of the survey data (see Appendix B for survey questionnaires and results) shows that just over 55 percent of the retired autos enter the auto wreckers' yards through insurance company auctions or contracts, with the remainder coming directly

FIGURE III-1
Auto Scrap Cycle


QUANTIFY
① RETIRED VEHICLES
② AUTO WRECKERS
PARTS
SECONDARY METALS
WASTE
QUANTIFY
③ SCRAP PROCESSORS
QUANTIFY
④ • STEEL MILLS • FOUNDRIES
QUANTIFY
⑤ STEEL PRODUCTS
⑥ • NEW/USED CAR DEALERS • INSURANCE CO.
⑦ • ARTIFICIAL REEF • LANDFILL • STORED • EXPORTED
⑧ ABANDONED
⑩ COLLECTED
⑨ UNCOLLECTED
QUANTIFY

from vehicle owners, new/used car dealers, state and local governments, and other sources. Further, most of these vehicles are inoperable at the time of acquisition as evidenced by the fact that wreckers report slightly over 92 percent of the vehicles were towed to their yards.

Title impediments contribute to abandonment and hinder the normal collection and acceptance of vehicles by auto wreckers. Lost titles or titles with liens accounted for 10 percent of the vehicles abandoned in a study conducted in 200 cities by the U.S. Department of Commerce (ref. 14). Title requirements affect the inflow to wreckers' yards because of the time and expense in transferring the title from vehicle owners to wreckers.

The age of an auto plays a very important role in the wreckers' business. Age affects the wreckers' decision to buy, reject or demand payment to accept an auto. This is due to the fact that they are primarily in the used parts business and not in the scrap business as explained later.

Nearly two-thirds of the private and commercial passenger vehicles on the road are six years old or newer, and thus represent the larger percentage of the wreckers' used parts market. Once a vehicle is past six years old, the parts demand and therefore the parts value declines rapidly. The survey results show that on an average, the autos acquired by the wreckers surveyed were five years old and were removed from their yards after 15 to 18 months.

Other impediments to acceptance of vehicles by auto wreckers include transportation costs and parts inventories. An inoperable auto which incurs a towing fee larger than its used parts worth is likely to be abandoned if the owner is unable or unwilling to pay the fee. Further, if the wrecker is overstocked with a particular year and model of car, he may reject it or charge the owner to accept it and thus contribute to its abandonment potential.

Once in the yards, the wreckers' primary goal is to sell salvageable parts. These parts may be sold as is, directly to a vehicle owner or garage, rebuilt by the wrecker and sold, or they may be sold to auto parts rebuilders. Analysis of the data shows that the auto wreckers responding to this question had an average of slightly over 85 percent of their gross sales in used parts.

The remainder of the auto wreckers' business is the sale of ferrous and non-ferrous scrap. Cast iron from the engine block, No. 1 heavy melting steel from the auto frame, copper from the radiator and wiring, lead from the battery, and zinc and aluminum alloys make up the bulk of the easily removed and easily sold uncontaminated scrap. This scrap is sold to foundries and/or scrap processors and commands a relatively high price. Survey data shows the wreckers' gross sales in this type of scrap to be about 9 percent of the total sales.

Other items such as the auto body, glass, plastic, upholstery, and rubber tires and hoses constitute scrap that is not easily removed or disposed of. The auto body which represents approximately 5 percent of the gross sales usually requires preparation by the wrecker before it will be accepted by the scrap processing industry. Preparation includes the removal of rubber, glass, upholstery, and copper wiring (i. e., all or most non-ferrous contaminants) from the auto body. This is accomplished in one of several ways:

- Hand stripping
- Open burning
- Incineration.

Hand stripping is usually done by two men who remove items such as:

- Windows
- Gas tank
- Tires and hoses
- Upholstery
- Headliner
- Headlights and taillights
- Dashboard.

The degree of auto body stripping is a function of the labor investment that the wrecker is willing to invest for the price he receives from the scrap processing industry.

Open burning consists of dousing the auto body interior with gasoline, kerosene or some other flammable substance and setting it on fire. This method of removing extraneous materials from the auto body is the least expensive in terms of labor and equipment investment.

Incineration is the third means of preparing an auto body for the scrap processing industry. One or several auto bodies are placed in the incinerator, depending upon its size. The bodies are burned by injecting fuel oil or natural gas into the incinerator. Emissions are generally controlled to minimize air pollution.

The majority of wreckers indicated that the price they received, or factors affecting that price are the major reasons why saleable parts are not removed immediately, the hulk prepared and sent immediately to a scrap processor. The survey results show that in the majority of cases, the price they receive for auto hulks does not cover the preparation and transportation costs to scrap processors' yards.

The preparation costs are associated with one of the three types of preparation previously identified. Many wreckers, 40.5 percent according to the survey, are forced to hand strip autos because of air pollution laws and the subsequent ban on open burning. Survey results show that this ban seriously affects their ability to profitably dispose of hulks.

Incineration of auto hulks is not a common practice among auto wreckers. One auto wrecker interviewed said that it would be ridiculous to invest $20,000 to $60,000 in a "clean" incinerator to support less than 5 percent of his business. This attitude appears to be prevalent among wreckers.

An alternative to auto hulk preparation as described above is the transferral of the auto, as is, to the scrap processing industry. Slightly over 35 percent of the wreckers surveyed chose this alternative. This alternative is available because scrap processors with shredding equipment are able to segregate the ferrous material from other contaminants during the shredding process. This type of equipment is described and discussed later. Another reason for the availability of this alternative is the fact that some processors will accept unprepared hulks at a reduced price, and if necessary accomplish the stripping themselves.

Once the autos have lost their value as a source of parts and high quality scrap, wreckers usually store the hulks for a period of time before disposing of them. 73.5 percent of the wreckers surveyed move the hulks when their yards are filled and they have no room for new acquisitions (see Appendix B). Only 5.6 percent of the responses showed a dependency on the price of scrap as a criteria for removal of the hulks when they lack space for additional autos. This is not inconsistent with the earlier statement that the price of scrap is the influencing factor in the removal of stripped hulks. Since scrap prices often do not cover the expenses of the wrecker in preparing and delivering the hulks to a processor he must treat them as a waste product, to be disposed of only when additional space is required for newer vehicles. Wreckers sometimes speculate on the price of scrap. They keep the hulks, waiting for higher scrap prices and end up with a capacity number of hulks. They are then forced to remove them at the going rate if they want to replenish their inventory of newer autos.

Some wreckers have their own flat bed trucks and deliver the hulks themselves to a scrap processor. Other wreckers depend upon the scrap processors to transport the hulks. Still others contract with independent collectors. The data shows that contracting with independent collectors is becoming an increasingly widespread practice among the wreckers surveyed.

It is uneconomical to ship auto bodies, unflattened, more than a few miles. Therefore, efforts are made to flatten them or otherwise reduce the auto body volume before shipping. Roofs of auto bodies are cut off, weights are dropped on the bodies, bodies are dropped, or they are run over by a bulldozer in an effort to achieve volume reduction. By far the most efficient means of achieving volume reduction is with an auto body crusher. This piece of equipment is a specially designed, stationary or mobile, hydraulic press which reduces an auto body to a 6' wide x 10" thick x original length slab. The press has a cycling time of 45 to 90 seconds and can crush approximately 100 bodies a day with efficient delivery, loading, and removal procedures. Development of this equipment now permits the hulk transporter to load from 20 to 30 crushed hulks on a truck compared with six to eight uncrushed or partially crushed bodies. In turn, transportation costs are lower, and a large number of autos can be moved in a relatively short period of time.

The pertinent characteristics of the auto wrecking industry can be summarized as follows:

- Over 85 percent of gross sales in used auto parts
- Vehicles 6 years old and newer constitute nearly 2/3 of used parts market
- Auto wreckers in urban areas are space limited rather than market limited - they will accept an auto with a high profit potential and remove an auto with little or no parts value

- Auto wreckers are increasingly dependent upon independent collectors to remove hulks
- Gross sales in auto body scrap, approximately 5 percent, does not justify investment in an incinerator
- Most wreckers, approximately 41 percent, hand strip autos before disposing of the hulks to a scrap processor
- Auto wreckers keep cars between 15 and 18 months before disposal.

The impediments to the inflow of vehicles and outflow of hulks can be summarized as follows:

Inflow

- Little or no economic incentive to acquire hulks older than 6 years old
- Some owners unwilling or unable to pay wreckers for auto removal or unwilling to accept wreckers' purchase price
- Transfer and titling procedures in some states are time consuming and may be expensive relative to an auto's worth to the wrecker.

Outflow

- Amount of contaminants in a hulk
- Cost to remove contaminants - related to pollution laws and therefore the requirements for hand stripping or incineration
- Transportation costs
- Scrap processor demand
- Scrap processor purchase price.

2. SCRAP PROCESSING INDUSTRY

After a vehicle has been stripped of saleable parts, secondary metals and high quality steel by the wreckers, it moves to the second processing point in the auto scrap cycle (see Figure III-1); the scrap processing industry. At this point in the cycle, the hulk is baled or slabbed and sheared into #2 bundle grade scrap or shredded into a grade of scrap roughly equivalent to #1 heavy melting steel in price. Once processed, it is sold to steel mills and is recycled into new steel. This appears to be a simple and straightforward activity. However, factors such as transportation costs, contaminant levels and air pollution laws affect the flow of auto hulks through the scrap processing industry.

A significant impediment to the flow of hulks is the presence of non-ferrous contaminants. Auto wreckers generally remove these materials but scrap processors, according to the equipment at their disposal, may remove the materials themselves. This step is necessary because these materials find their way into the steel making process and contaminate the steel by producing undesirable physical characteristics in the steel.

Among processors with baling or slabbing equipment, removal of these contaminants before processing is particularly critical. Both methods of processing the scrap involve volume reduction in a hydraulic press making the removal of any but surface contaminants virtually impossible. Processors with this type of equipment will either reject improperly prepared hulks or prepare them in their own yards by hand stripping or incinerating. The data shows that approximately one-third of the processors surveyed either hand strip or incinerate hulks to remove contaminants.

Processors with shredding equipment are also faced with transportation cost problems and the problem of maintaining an adequate supply of hulks. Because of the large capacity and capital investment, $400,000 to $4,000,000, shredders must maintain a high flow of autos. This is evidenced by the fact that of the number of shredders responding to the survey, 23.6 percent had mobile car crushers. This represents almost four times the percentage of car crushers owned by other processors (6.7 percent - see Appendix B).

In using shredding or fragmentizing equipment (the terms are synonomous) processors are not too concerned about contaminant removal prior to processing. They usually require that only the engine block and tires and, sometimes, seats are removed from a hulk. The hulks are then shredded into relatively small pieces of metal and the ferrous material removed by a magnet, leaving the non-ferrous contaminants as a residue. In some cases, the shredded material is incinerated and subjected to primary and secondary magnetic separation.

Another impediment to the flow of all scrap is the cost of transportation from the scrap processors' yards to the steel mills. This factor was reported by the processors as a major obstacle in moving scrap. The scrap iron and steel industry claims that railroad rates are discriminatory against scrap in favor of iron ore. An article in Waste Age, Role of Transportation in Disposal of Obsolete Metallic Waste indicated that, on a ferrous content ratio between scrap and iron ore, transportation rates for scrap should be only 1.5 times that of iron ore. Figures from the Interstate Commerce Commission for 1968 show that the rate is approximately 2.25 times that of iron ore.

The pertinent characteristics of the scrap processing industry can be summarized as follows:

- Scrap processors purchase auto hulks to process into #1 Heavy Melting, #2 Bundle or shredded grades of scrap
- Scrap processors use three basic types of processing equipment; shredder, baler or shear
- Firms that operate shredders require a high flow of auto hulks and own more portable flatteners to support this requirement
- Regardless of the type of equipment operated, auto hulks require some degree of preparation prior to processing
- Scrap processors maintain small inventories of autos on the order of one auto for every 16 processed and sold
- Approximately 75 percent of the auto scrap processed is domestically consumed.

The impediments to the inflow of hulks to scrap processors and the outflow of auto scrap can be summarized as follows:

Inflow

- Presence of contaminants in hulks
- Transportation costs
- Purchase price that can be offered.

Outflow

- Transportation costs
- Contaminant levels
- Price and demand for auto scrap.

3. CITIES

All the cities participating in the study survey have ordinances dealing with abandoned autos. The ordinances are part of either a sanitation code or motor vehicle code and are the responsibility of the sanitation department or police department. The responsibility for enforcing the ordinances rests upon the city police departments in all the cities surveyed. Penalties for abandoning an automibile range from paying a towing and storage charge to paying up to a $500 fine and imprisonment. These penalties do not appear to act as a sufficient deterrent primarily because enforcement is minimal. Also some of the autos come from out of state and, therefore, the chances of catching the abandoner are slight.

The collection of abandoned autos in over 80 percent of the cities responding, is made by private contractors under the supervision and authority of the police departments. New York City, for example, through its sanitation department, offers eight one-year competitively bid contracts to wreckers for abandoned auto removal. The eight contracts cover the five boroughs. Wreckers, depending upon the borough, pay the city up to $5.25/car for the salvage rights. In Manhattan, the city must pay the wreckers up to $10.00/car for their removal. The incentive for wreckers to pay for the privilege of removing the autos is the fact that they obtain the salvage rights to abandoned autos or collect towing and storage charges for illegally parked autos. New York City pays for the removal of autos in Manhattan because of traffic congestion and the fact that most, if not all, wrecking firms are located in other boroughs. Based upon data furnished by the Deputy Commissioner of Sanitation and by estimating administrative costs of the program, the cost of removing 65,000 cars is approximately $2.00 per car. The collection of autos is made under the direction of the sanitation department.

Only 25 percent of the cities surveyed, provide disposal sites for unwanted vehicles. The availability of such a site did not seem to reduce incidences of abandonment. The extent to which these disposal sites were publicized, however, was not determined.

Once the vehicles are collected, disposal becomes a problem. Most cities store the vehicles while efforts are made to contact the owner. If it is unclaimed the auto is sold at a public auction to the highest bidder. In some instances, autos are disposed of without any effort to contact the owner. In Chicago, for example, there is no notification of disposal if the auto is:

- Over seven years old and no title is available or no Junk Certificate is available
- Between six and seven years old and has a Junk Certificate.

In addition to holding public auctions or selling salvage rights to wreckers, the cities have the option of selling the auto to scrap processors. City officials were asked if the scrap processing industry provided a ready means for the disposal of unwanted autos that were impounded. Just under 55 percent of those responding to the question indicated that the proximity of a scrap processor provides a ready market for their auto hulks (see Appendix C). Chicago has, for example, a contract with a large shredding company and disposes of these autos unclaimed and unsaleable at public auctions.

Analysis of the characteristics of abandonment sites showed that 36 percent were collected from residential areas, 28 percent from city streets and 20 percent from low income housing developments. No significant conclusions can be derived from this percentage spread.

Analysis of data supplied by city officials indicate that abandoned auto collection and disposal problems have been largely solved in the cities at taxpayers' expense. Necessity has forced the solution. In most cities, traffic problems exist. The problem is further aggravated by autos illegally parked during rush hours. These illegally parked cars, which include abandoned autos, are cleared away on a daily basis. Those autos not on heavily traveled thoroughfares are also removed. Their removal is prompted by the fact that cities have time limitations on the duration of parking on public property. These time limitations range from two to seven days, thus ensuring the prompt removal of abandoned autos.

As shown in Appendix C, nearly 3/4 of the cities responding to the survey did not have historical or current data on abandoned autos. The Department of Commerce's "Motor Vehicle Agandonment in Urban Areas", (ref. 14) shows that 90 percent of the abandoned autos are removed within 10 days from public property and 95 percent within 30 days from private property. Abandoned auto statistics obtained from the cities is discussed further in the next chapter.

The characteristics of the cities surveyed, with respect to the abandoned auto problem, can be summarized as follows:

- All cities surveyed have laws/ordinances against abandonment
- Enforcement of abandonment laws/ordinance is the responsibility of police departments
- Most cities hire contractors to tow illegally parked and abandoned autos
- Only 25 percent of the cities have disposal sites
- Only two cities surveyed have nearly self supporting abandoned auto programs
- Most vehicles are abandoned on public property in cities
- 75 percent of the cities do not have historical or current abandonment data
- The collection problem associated with abandoned autos has been largely solved in larger cities
- Abandonment is increasing in some of the cities surveyed.

Impediments to the prevention of abandonment and/or collection and disposal of abandoned autos can be summarized as follows:

- Vehicles abandoned in a city are often registered in another state or have identifying numbers removed making owner identification difficult if not impossible
- Enforcement of abandonment laws has a low priority due to police workload in other enforcement activities

- Cost of abandonment law enforcement is high; it is less expensive to permit abandonment and pay for collection
- Notification procedures sometimes require a lengthy storage time, up to six months, before disposal of a vehicle is permitted.

4. STATES

Nearly all states provide laws whereby an auto abandoned on public or private property can be impounded and, if unclaimed, sold. The proceeds from the sale are used to pay for collection, storage, and disposal with the remainder of the money held for some period of time for the owner, or reverting to a state fund. In spite of those laws, most states do not have a clearly defined state administered abandoned auto program. In most cases, only autos abandoned on state highways or state land are handled by state employees, usually the state police or highway department. Removal of autos from private or municipal property is handled at the municipal or county level through state laws and local ordinances.

Four states responding to the survey, Maryland, Minnesota, Vermont, and Virginia, have, or propose to have, a state program which provides assistance to those involved in the collection, storage, and disposal of autos. Maryland's program provides a bounty for all autos processed through auto wreckers and scrap processors and is considering additional aid to municipalities. Minnesota plans to contract with private contractors for the collection, storage, and disposal of abandoned autos. Vermont's highway department provides transportation subsidies to counties for the removal of backlogs of abandoned autos. Virginia is proposing a transportation subsidy for all out-of-service autos.

As was found to be the case in municipalities, most state authorities contract with private contractors to remove abandoned autos. These autos are collected by the nearest wrecker willing to do the job. The only difference between municipality collection characteristics and state collection characteristics is the supervising authority. In most cases, this authority is the state police.

Officials in only four states were able to provide historic information on the magnitude of the abandonment problem. The abandoned auto populstion is discussed in the next chapter on quantification.

Characteristics of the states surveyed can be summarized as follows:

- Most states have laws prohibiting abandonment
- Few states have abandoned auto programs
- Abandonment data is sparse
- Most states do not license auto wreckers or scrap processors.

Impediments to prevention of abandonment and for collection and disposal of abandoned autos are similar to those of municipalities and can be summarized as follows:

- Enforcement costs
- Notification requirements.

5. SCRAP CONSUMERS - STEEL MILLS AND FOUNDRIES

When a vehicle enters a wrecker's yard two items are of immediate concern, reusable parts and high quality scrap as described earlier. The high quality scrap, such as copper and cast iron is usually sold directly to foundries to be recycled into new metal products. This scrap represents no problem in the auto scrap cycle because it is relatively contaminant free and of known chemistry.

The remainder of the auto, the steel body and frame, is separated from items such as tires, wiring, upholstery, plastics, etc., and is sold, given, or its disposal paid for by the wrecker. Scrap processors produce various grades of scrap from the hulk depending upon the type of processing equipment used as discussed earlier.

The #2 Bundle grade of scrap automotive slab and shredded scrap contain most of the obsolete[1] automotive scrap produced. It is estimated that 8.1 million tons of these grades of scrap were produced in 1970 and that between 5 and 6 million tons were of automotive origin. See Appendix D for estimating details and tonnages produced in earlier years.

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[1] The term obsolete refers to an item that is no longer suitable to perform its original intended function, e.g., automobile no longer suitable as a means of transportation.

Many texts, such as items 2, 5, 11, 13, 26, 27, and 28 in Appendix A, have been written on the economic and technical utilization of scrap by steel manufacturers operating various types of furnaces. In 1969, 28.4 million tons of purchased scrap were used by the steel industry. Approximately 15 percent is used in blast furnaces for the production of pig iron. Steel making furnaces, in turn, use pig iron together with scrap steel for the production of steel. Over 90 percent of steel production currently takes place in "integrated" plants, where pig iron is transferred directly to the steel furnaces in a molten state. Steel furnaces are of three primary types: open hearth, basic oxygen (BOF), and electric. The open hearth accounts for about 40-45 percent of total U.S. steel production and uses about 40 percent scrap in its furnace charge. The BOF was first introduced into the U.S. in 1954 and now accounts for almost 45 percent of U.S. steel production. The scrap used by the BOF is about 28 percent of the total charge. Electric furnaces use a 98 percent scrap charge, and represent about 15 percent of U.S. steel production.

Iron foundries used 4.5 million tons of purchased scrap in 1969. Two major types of furnaces are used in producing cast iron. The cupola furnace accounts for over 90 percent of cast iron production and uses about 74 percent scrap ferrous metal in its charge. The air furnace, which accounts for most of the balance of cast iron production, uses about 85 percent scrap in the charge.

The characteristics of the iron and steel manufacturers and impediments to the use of scrap in steel production and summarized below. Before summarizing the characteristics and impediments, the point should be emphasized that these impediments exist for the flow of all obsolete scrap which includes those autos normally recycled through the industrial flow as previously described.

Characteristics

- Three main users of obsolete automotive scrap are: U.S. steel industry, U.S. iron and steel foundry industry, and export market
- The steel industry constitutes the major consumer of obsolete automotive scrap

- Steel mills, except those operating electric furnaces exclusively, currently have extensive capitol investments in coal and iron ore mines thus committing them to virgin ore intensive steel production
- The upper limit of scrap utilization in open hearth furnaces is approximately 40 percent; in basic oxygen furnaces approximately 30 percent; in electric furnaces approximately 98 percent
- Steel industry generally uses mill-generated scrap before purchasing scrap from scrap processors.

Impediments

- Transportation costs between scrap procesors and consumers
- Steel industry economic commitment to virgin ore
- Contaminant level in obsolete automotive scrap
- Upper limit of scrap utilization in open hearth and basic oxygen furnaces.

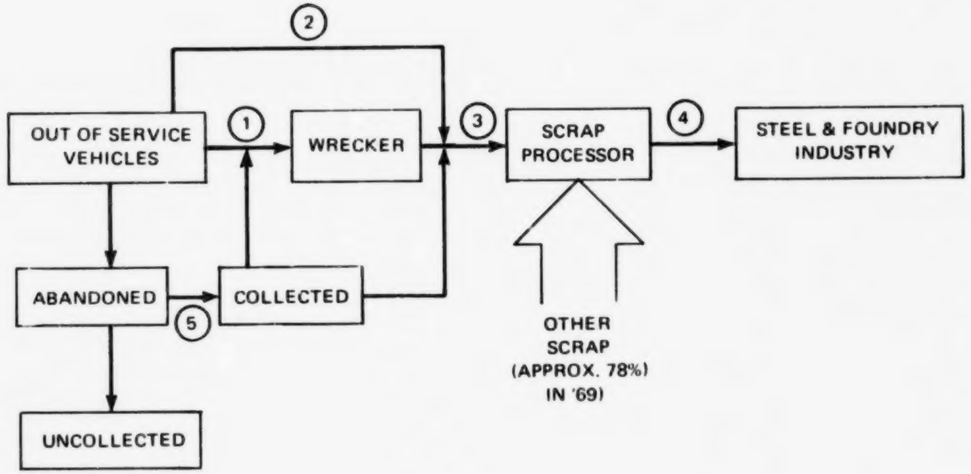
6. IMPEDIMENTS TO THE INDUSTRIAL FLOW OF AUTO SCRAP

Figure III-2 summarizes five basic impediments to the flow of out-of-service automobiles from owner to the steel and foundry industry. These are summarized below.

(1) Owner to Wrecker

Abandonment is caused primarily by ignorance of the proper disposal methods, or because the cost of removal exceeds any possible value of the vehicle. This impediment can be relieved through some law enforcement program which forces responsible action by vehicle owners, or by artifically increasing the value of the hulk through a disposal deposit program.

FIGURE III-2
Impediments to the Industrial Flow of Auto Scrap


OUT OF SERVICE VEHICLES
WRECKER
SCRAP PROCESSOR
STEEL & FOUNDRY INDUSTRY
ABANDONED
COLLECTED
UNCOLLECTED
OTHER SCRAP (APPROX. 78%) IN '69)
①
②
③
④
⑤

① • ABANDONED DUE TO:
  – IGNORANCE - 25%
  – ECONOMICS - 55%
  – TITLE IMPEDIMENT - 10%
  – OTHER - 10%
  (URBAN ONLY)
• USED PARTS DEMAND (AGE & CURRENT STOCK)
• TOWING CHARGES
• TITLE IMPEDIMENT

② • PREPARATION REQUIREMENTS
• TOO FEW PROCESSORS FOR EFFICIENT FLOW
• WON'T COLLECT SINGLE AUTO (TRANSPORTATION COSTS)

③ • CONTAMINANTS
• TRANSPORTATION
• SCRAP PROCESSOR DEMAND
• COST OF REMOVING CONTAMINANTS

④ • TRANSPORATION
• DEMAND FOR SCRAP
• CONTAMINANTS
• STEEL IND. COMMITMENT TO ORE

⑤ • LOW PARTS AND/OR SCRAP VALUE (OLDER VEHICLES)
• TITLE, TRANSFER NOTIFICATION
• TRANSPORTATION

(2) Direct Flow to Scrap Processors

Scrap processors deal in auto hulks at the equivalent of the wholesale level. They don't generally deal in single autos and are few in number and dispersed, so that transportation costs directly to a processor are often high. This path, however, is not a natural path in the junk car flow, and is not of special concern.

(3) Wrecker to Scrap Processor

Hulks are a waste product to auto wreckers and generally represent a disposal cost to his business. Thus, the wrecker will often accumulate hulks as long as he has room, to avoid that expense. Some states levy an inventory tax on old hulks to encourage their regular flow to scrap processors.

(4) Scrap Processor to Steel Mill

The barriers to scrap utilization by the steel/foundry industry are threefold. First, the steel making process has natural limitations on scrap utilization, as previously discussed. Second, contamination in scrap limits its price and market. Third, transportation cost differentials create some limited competition between scrap and virgin ore. All of these problems raise questions well beyond the problem of automobile abandonment.

(5) Collection of Abandoned Vehicles

An auto wrecker, independent collector, or scrap processor can only be expected to collect abandoned cars voluntarily when the authorities cooperate on problems of title transfer, and when the value of the car warrants the cost of collection. The cost generally cannot be justified, and collection must be fostered through some combination of contracts with wreckers and subsidies for the transportation of the hulks.

IV. QUANTIFICATION

The following parameters are of primary interest in quantifying the capacity of, and flow through, the auto scrap cycle:

- The number of vehicles going out of service per year
- The inventory and flow of autos through the auto wrecking and scrap processing industries
- The number of vehicle hulks used in steel manufacture
- The number of vehicles abandoned per year, the existing backlog and its distribution on public and private property
- The capacity of the entities involved in the industrial flow to process out-of-service vehicles
- The number of auto wrecking and scrap processing firms.

The vehicles taken out of the vehicle-in-use population at car dealers and insurance companies are treated as going directly to auto wreckers because of the relatively short time (approximately three to six weeks) that they spend at dealers and insurance company lots. Vehicles at solid waste disposal sites or "graveyards" as they are sometimes called were considered to be out of the industrial flow and essentially abandoned. They mar the aesthetics of the countryside and go largely unrecycled.

The quantification procedures and results for each of the above parameters are summarized below and discussed in subsequent sections.

1. SUMMARY OF QUANTIFICATION EFFORT AND RESULTS

The results of the quantification effort are summarized below.

(1) Vehicle Retirement Rate

This data was obtained from Ward's 1970 Automotive Yearbook, and is derived by summing state annual registration data. The retirement rate between 1960-1969 has been relatively stable, averaging 8. 96 percent of the vehicles in use. The average retirement age has not changed markedly since 1939. From 1955-1965 the average retirement age was 5. 8 years old. Between 1965-1970 retirement age averaged 5. 0 years old. The cumulative total of retired vehicles from 1958 to 1970 is 72, 416, 000 vehicles.

(2) Flow and Inventory of Vehicles at the Scrap Processing Industry

The steps taken to estimate the flow and inventory by year of vehicles at this point in the industrial cycle is shown in Figure IV-1. The statistical data employed to develop these estimates is included in Appendix C. By this procedure, it is estimated that between 53. 9 and 64. 6 million vehicles have been processed by the scrap industry during the years 1958 to 1970. Vehicle inventories have been estimated to be 305, 100 to 360, 200 vehicles in 1970.

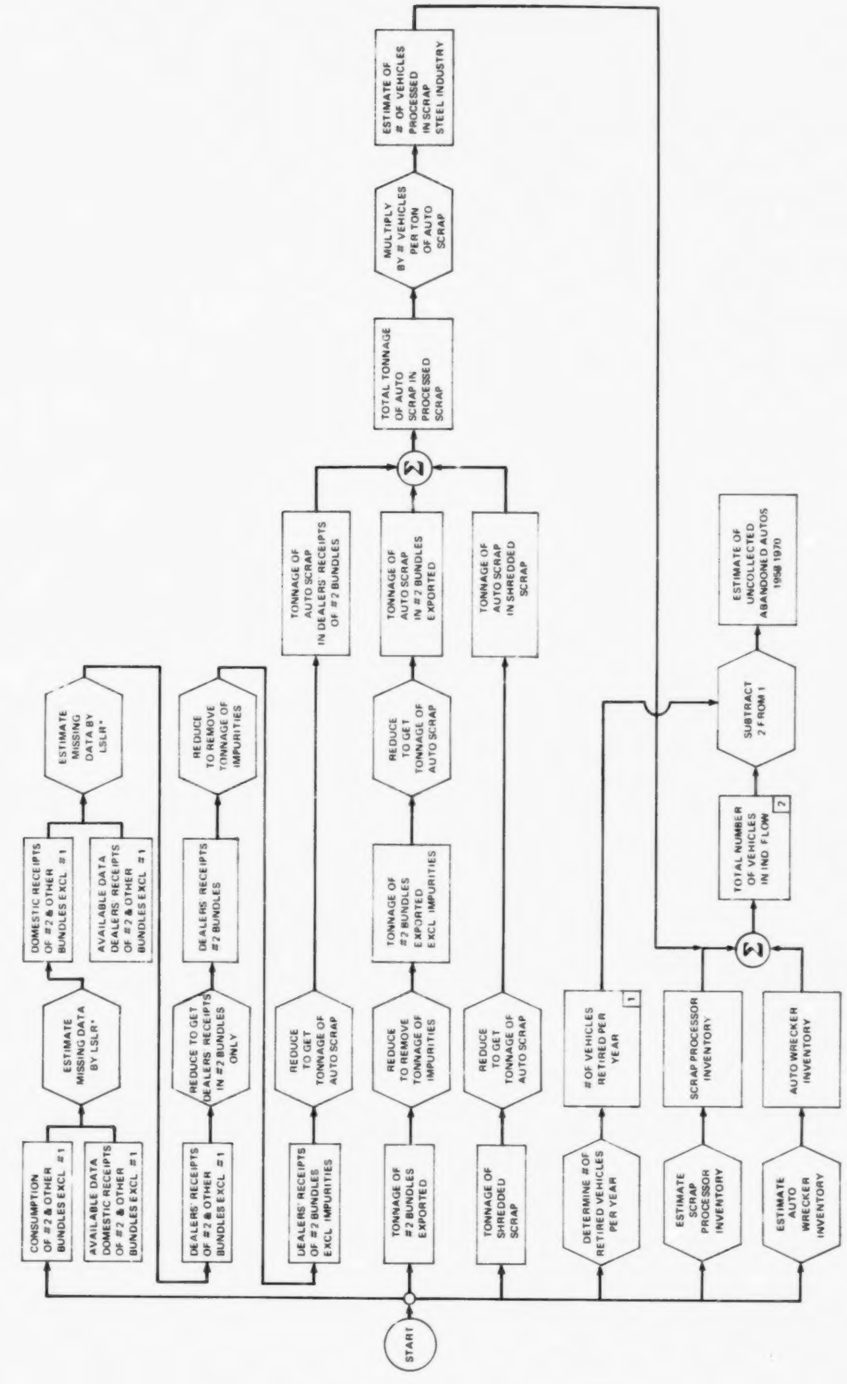
(3) Flow and Inventory of Vehicles at the Auto Wrecking Industry

The outflow of vehicles from auto wreckers has been assumed approximately equal to scrap processors inflow. For the year 1970, it is estimated that between 5 and 6 million cars have left auto wrecking yards to be processed by the scrap industry. The auto wrecking industry inventory of vehicles in 1970 is estimated at 9. 9 million vehicles.

(4) Vehicles Not Processed into Scrap and Abandoned Vehicles

Vehicles not processed into scrap have been estimated to be between 8 and 20 million by the procedure summarized in Figure IV-1. Other procedures were employed to narrow this range. The results are as follows:

FIGURE IV-1
Uncollected Abandoned Auto Estimating Procedure


START
CONSUMPTION OF #2 & OTHER BUNDLES EXCL #1
AVAILABLE DATA DOMESTIC RECEIPTS OF #2 & OTHER BUNDLES EXCL #1
ESTIMATE MISSING DATA BY LSLR*
DOMESTIC RECEIPTS OF #2 & OTHER BUNDLES EXCL #1
AVAILABLE DATA DEALERS RECEIPTS OF #2 & OTHER BUNDLES EXCL #1
ESTIMATE MISSING DATA BY LSLR*
DEALERS' RECEIPTS OF #2 & OTHER BUNDLES EXCL #1
REDUCE TO GET DEALERS RECEIPTS IN #2 BUNDLES ONLY
DEALERS RECEIPTS #2 BUNDLES
REDUCE TO REMOVE TONNAGE OF IMPURITIES
DEALERS' RECEIPTS OF #2 BUNDLES EXCL IMPURITIES
REDUCE TO GET TONNAGE OF AUTO SCRAP
TONNAGE OF AUTO SCRAP IN DEALERS' RECEIPTS OF #2 BUNDLES
TONNAGE OF #2 BUNDLES EXPORTED
REDUCE TO REMOVE TONNAGE OF IMPURITIES
TONNAGE OF #2 BUNDLES EXPORTED EXCL IMPURITIES
REDUCE TO GET TONNAGE OF AUTO SCRAP
TONNAGE OF AUTO SCRAP IN #2 BUNDLES EXPORTED
TONNAGE OF SHREDDED SCRAP
REDUCE TO GET TONNAGE OF AUTO SCRAP
TONNAGE OF AUTO SCRAP IN SHREDDED SCRAP
Σ
TOTAL TONNAGE OF AUTO SCRAP IN PROCESSED SCRAP
MULTIPLY BY # VEHICLES PER TON OF AUTO SCRAP
ESTIMATE OF # OF VEHICLES PROCESSED IN SCRAP STEEL INDUSTRY
DETERMINE # OF RETIRED VEHICLES PER YEAR
# OF VEHICLES RETIRED PER YEAR
1
ESTIMATE SCRAP PROCESSOR INVENTORY
SCRAP PROCESSOR INVENTORY
ESTIMATE AUTO WRECKER INVENTORY
AUTO WRECKER INVENTORY
Σ
TOTAL NUMBER OF VEHICLES IN IND FLOW
2
SUBTRACT 2 FROM 1
ESTIMATE OF UNCOLLECTED ABANDONED AUTOS 1958 1970

* LSLR - LEAST SQUARE LINEAR REGRESSION

- Average of high and low estimates from present study[1] (less scrap processor inventory) = 12,724,000 autos
- Mobile Auto Crushers Corporation of American Study[2] (less scrap processor inventory) = 12,780,000 autos

The estimate of unprocessed vehicles less the scrap processor inventory was therefore estimated to be 12.75 million autos.

The auto wrecking industry inventory in 1970 is estimated to be 77.6 percent of the unprocessed vehicles or 9.9 million autos. The remaining 22.4 percent of the unprocessed vehicles or 2.85 million vehicles is estimated to be the abandoned uncollected vehicle accumulation from 1958 to 1970. Because many abandoned vehicles are processed into scrap and because they are not distinguishable from vehicles entering the industrial cycle normally, the abandonment rate was indeterminant. The data shows that the number of unprocessed vehicles is increasing but this is not necessarily due to increased abandonment.

(5) Number and Capacity of Auto Wrecking Firms

The number of auto wreckers has been estimated to be 22,127 based on data collected from 11 states and extrapolated to a national average. It was found that auto wreckers in urban areas are space limited in their capacity to accept vehicles. Wreckers in urban and rural areas are dependent on the used parts market in their ability to accept vehicles.

(6) Number and Capacity of Scrap Processors

There are approximately 3,500 scrap processors in the United States, 1,200 of whom possess most of the processing equipment and account for 95 percent of the scrap processed. Based on a 40-hour workweek, scrap processors have the capacity to process approximately 53 million tons of scrap which exceeds the 1969 consumption rate by 7 million tons. The 53 million ton capacity could be substantially increased by adding a second shift to the industry.

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[1] See Appendix C.

[2] See Item 29, Appendix A.

2. VEHICLE RETIREMENT RATE

The number of vehicles which go out of service each year are computed by R. L. Polk and Company by adding to the vehicles in use on January 1 of a particular year the number of new vehicles registered during the year, and then subtracting the number of vehicles registered on December 31 of that year. Appendix C, Table B, column 1 shows the compilation of data from 1958 to 1970. Between the years 1940-1969, vehicle scrappage ranged from 1.9 to 11.2 percent of the private passenger vehicles in use. From 1960 to 1969, this rate has been fairly stable with a low of 7.9 percent in 1961 and a high of 10.4 percent in 1966. Figure IV-2 shows the out-of-service vehicles on a yearly basis, and Figure IV-3 shows the cumulative total of out-of-service vehicles from 1958 to 1970.

The average age of cars scrapped has not changed markedly from 1939 to 1970 with the exception of the year after World War II. In 1939, the average age of scrapped vehicles was 5.6 years. In 1946, the scrappage age was over 9 years old. From 1955 to 1965 the average age of scrapped vehicles was 5.8 years. The results from the survey of the auto wrecking industry from 1965 to 1970 indicate that the average age of vehicles they acquire is approximately 5.0 years.

3. FLOW AND INVENTORY OF VEHICLES AT THE SCRAP PROCESSING INDUSTRY

An estimate of the number of vehicles leaving scrap processing yards was derived from the tonnages of #2 bundles, automotive slab and shredded scrap leaving scrap processing yards.* These three grades of scrap were used because they contain nearly all of the auto

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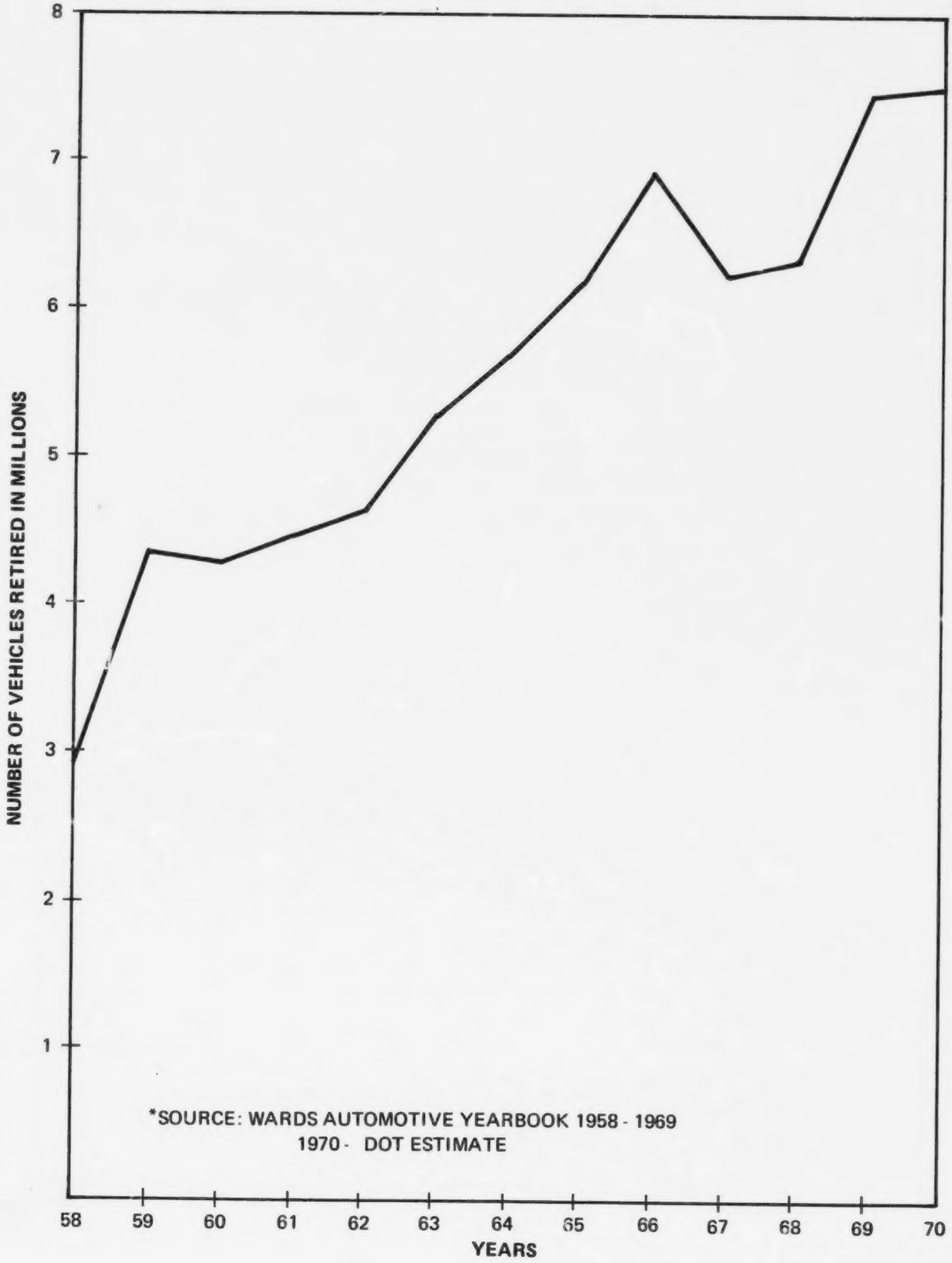
* Sufficient data in terms of #2 bundles was not available to carry the estimating procedure farther back than 1958.

FIGURE IV-2
Retired Passenger Vehicles*
Versus Years (1958-1970)



*SOURCE: WARDS AUTOMOTIVE YEARBOOK 1958 - 1969
1970 - DOT ESTIMATE

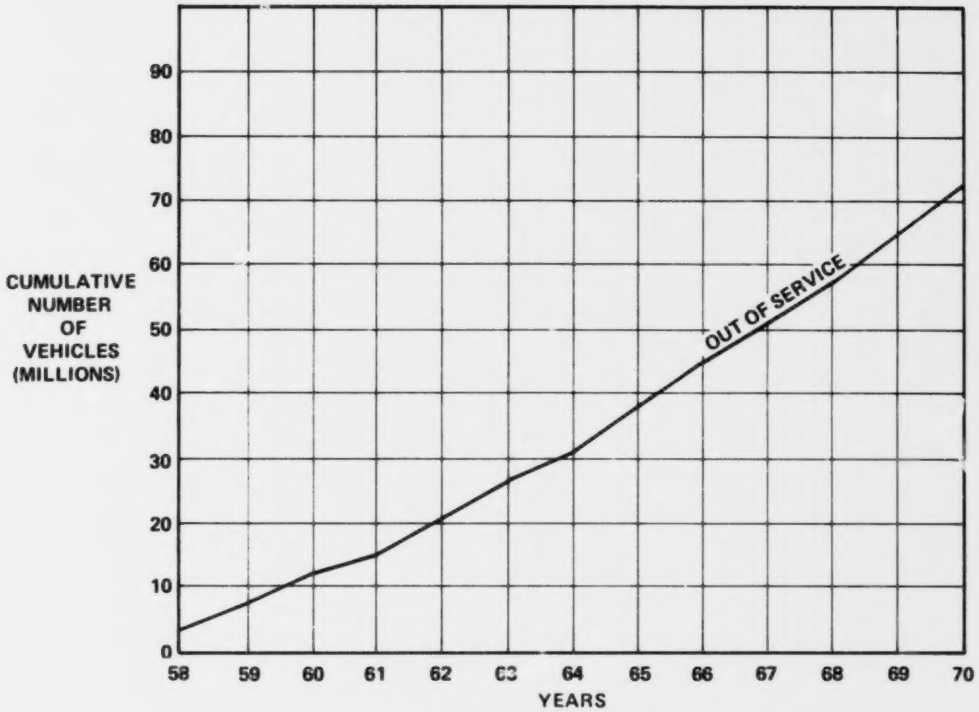
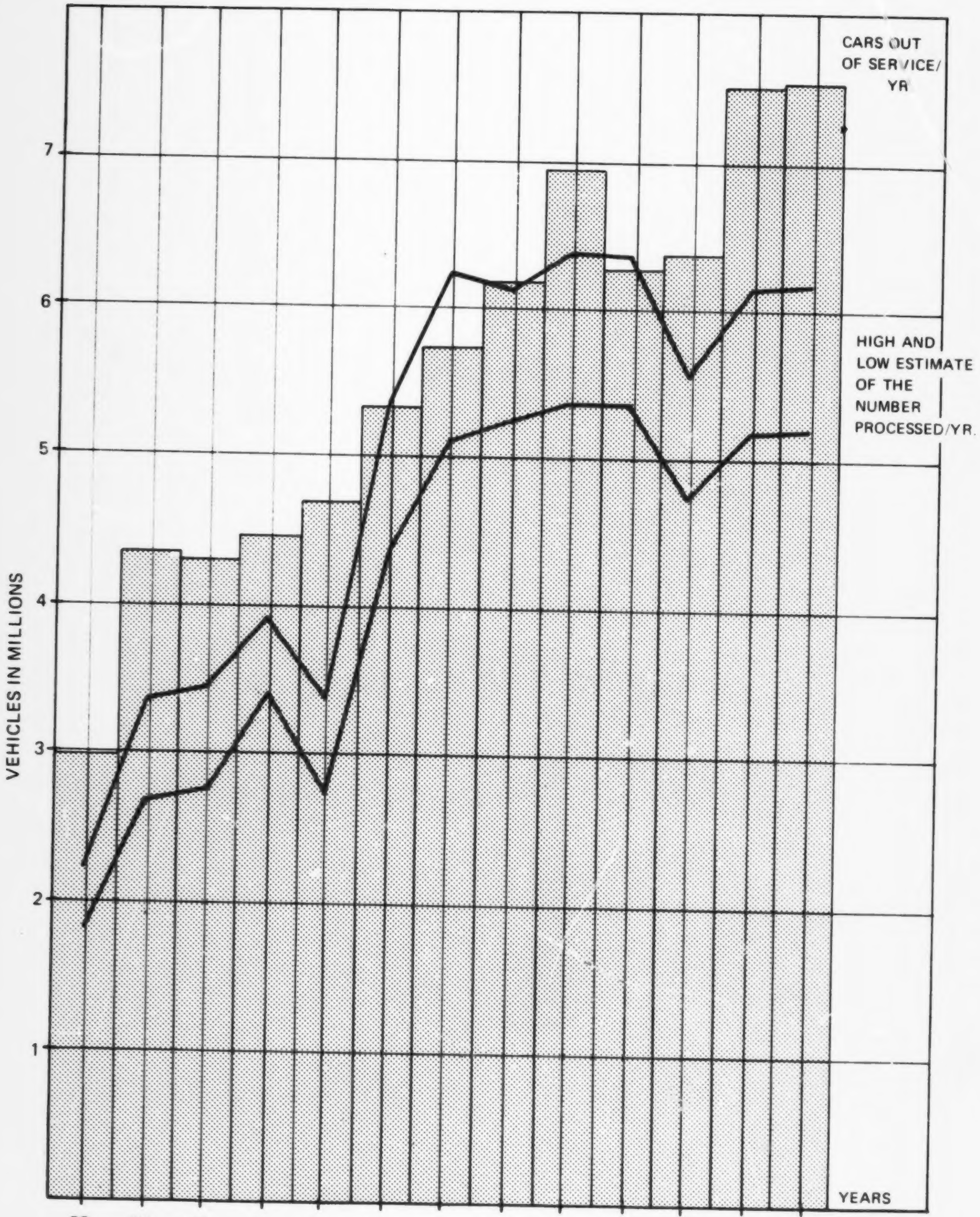


FIGURE IV-3
Cumulative Number of Vehicles
Out-of-Service - 1958 to 1970

body scrap produced. By applying appropriate multiplying factors to these tonnages and assuming an average weight for an auto hulk, a range for the number of vehicles consumed by the steel industry per year was determined. The factors used can be found in Appendix C, tables 2, 3, 4, and 5 together with the details of the estimating procedure and the summary tables. Figure IV-4 shows the high and low estimates of vehicles processed into scrap for each year from 1958 through 1970, superimposed upon the number of vehicles retired (from Figure IV-2). Only in the years 1964 and 1967 did the vehicles processed approach or exceed the number of vehicles out-of-service. Figure IV-5 shows the cumulative high and low estimates of processed vehicles compared with the cumulative number of out-of-service vehicles. The difference between the cumulative curves is the estimate of the number of unprocessed vehicles since 1958, and is discussed in section 5 of this chapter - "Vehicles Not Processed Into Scrap and Abandoned Cars."

FIGURE IV-4
Annual Range of Estimates of
Vehicles Processed Into Scrap



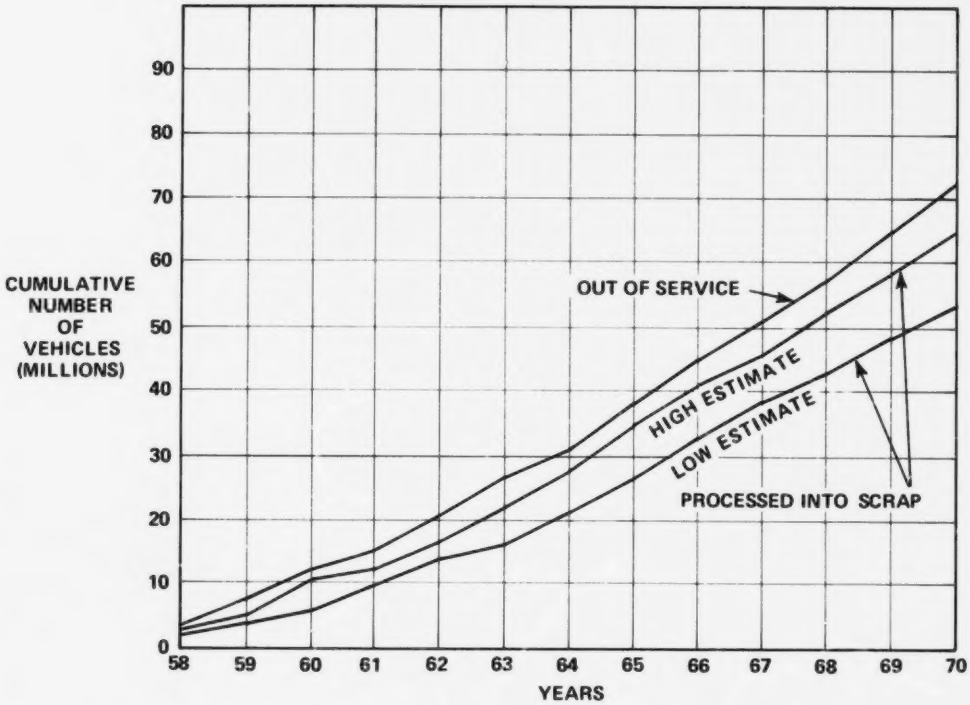


FIGURE IV-5
Cumulative Vehicles Out-of-Service and
Processed Into Scrap - 1958 to 1970

Interviews with personnel in the scrap processing industry and the Bureau of Mines study, "Automobile Disposal, A National Problem," show that scrap processors maintain very small inventories of auto scrap. Over a one-year period, scrap processors will process approximately 16 cars for every car they have in their inventories. The inventory estimates are contained in Appendix C, Table 6, by year.

The total number of vehicles acquired by processors in any one year is determined by adding to the vehicles processed any net change in the estimated inventory.

4. FLOW AND INVENTORY OF VEHICLES AT THE AUTO WRECKING INDUSTRY

The flow of vehicles from the auto wrecking industry was assumed to be equal to the flow of vehicles into the scrap processing industry. The assumption is in error to the extent that a small portion of the vehicles processed bypass auto wrecking firms and go directly to the processors. This usually occurs when vehicles have no parts value and are, therefore, unsaleable to auto wreckers.

The results of "Automobile Disposal, A National Problem" by the Bureau of Mines and the survey conducted during this study show that auto wreckers generally retain autos in their inventories for a period of 12 to 18 months. This supply represents their working inventory. Fifteen months was chosen as the inventory life for computing the size of the auto wreckers' inventories. The inventory at the auto wrecking industry is shown in Appendix C, Table 7. The inventory as shown in Table 7 shows only a relative increase in vehicles since 1958. The absolute value of wreckers' inventories in 1958 to which these number should be added is unknown.

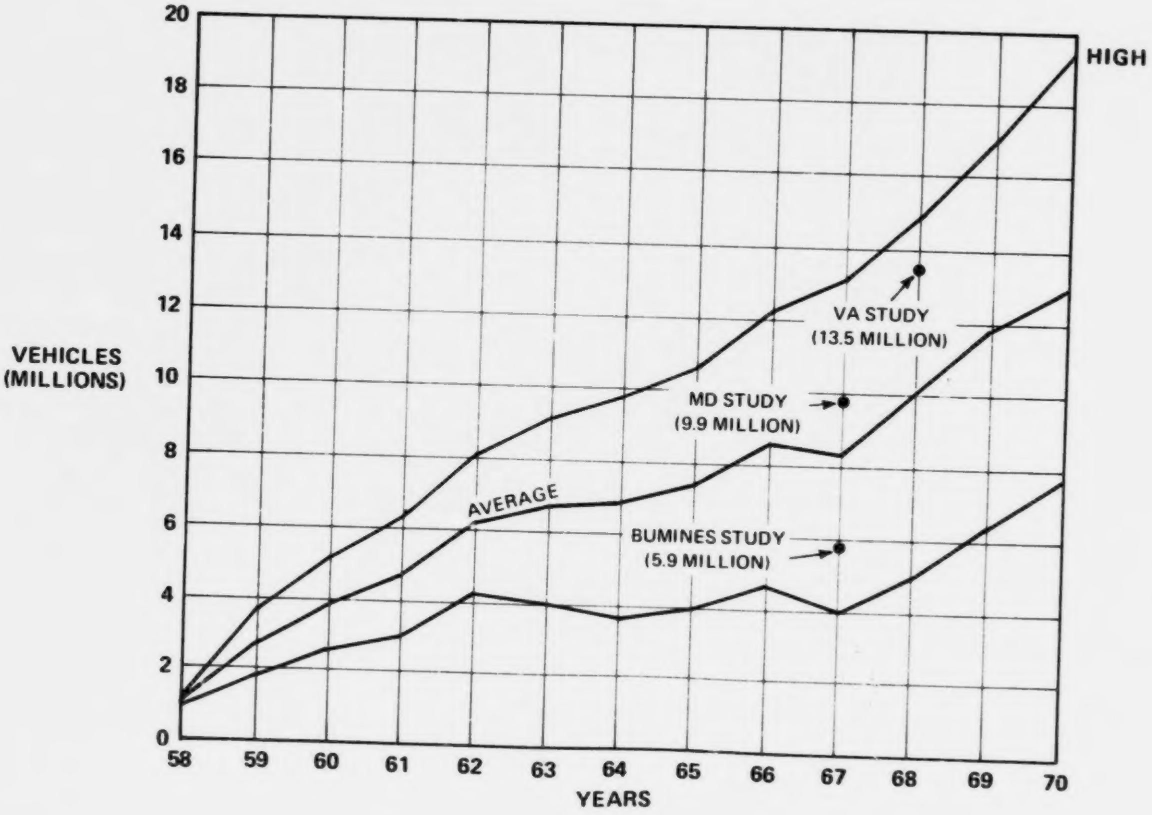
The number of vehicles entering the auto wrecking industry was computed by summing the outflow and net change in inventory.

5. VEHICLES NOT PROCESSED INTO SCRAP AND ABANDONED CARS

The vehicles not processed into scrap for use at the steel and foundry industries, that is those in scrap processor and auto wrecker inventories and those abandoned and uncollected, are shown in Figure IV-6. The cumulative amount of these vehicles since 1958 range from 8 to 20 million according to the results of the estimating procedure detailed in Appendix C.

As stated earlier, scrap processors maintain small inventories and do not tend to accumulate autos in their yards. The current 1970 range of inventories can therefore be subtracted from the cumulative unprocessed estimates to yield the number of uncollected abandoned autos and autos in wrecker inventories:

FIGURE IV-6
Unprocessed Vehicles - 1958 to 1970



High estimate of unprocessed cars = 18,180.2
Scrap processor inventory = - 305.1
Unprocessed vehicles - High = 17,875.1 (in 1000's)

Low estimate of unprocessed cars = 7,967.2
Scrap processor inventory = - 360.2
Unprocessed vehicles - Low = 7,609.0 (in 1000's)

Average = 12,724,000 autos

The estimate of auto wrecker inventories as determined by the estimating procedure is not considered to be sufficiently accurate to perform the same subtraction as was done with scrap processors' inventories. The methodology used in determining wrecker inventory is sensitive to autos processed into scrap and not upon the used parts market which constitutes most of the wreckers' business. Sufficient data to portray wreckers' operations as a function of the used parts market was not available during the study.

As a means of reducing the wide range of unprocessed vehicles and determining auto wreckers' inventories, items 2, 28, 29, 30, and 31 in Appendix A were studied. Item 29 was a study of retired abandoned uncollected vehicle inventories in 800 counties in portions of 20 states and covered 25 percent of the land area of the 48 contiguous states. The total number of vehicles in the study areas in wrecker and processor inventories and vehicles abandoned and uncollected amounted to 2.36 million autos. The vehicle registration was 16.583 million. Taking a ratio of wrecker inventory and abandoned, uncollected autos to the total registration for the year 1970 and extrapolating it to a national average, the number of autos residing in wrecker inventories and the number of uncollected, abandoned autos becomes:

$$\frac{\text{Vehicles in wreckers inventory and uncollected}}{\text{Total vehicle registration}} \times \text{total U.S. registration}$$

$$\frac{2.36}{16.583} \times 89.861 = 12,780,000$$ vehicles--estimated to be in wreckers and processors inventories and uncollected

Less average processor inventory - 332,700
12,447,300 Uncollected vehicles

This number closely approximates the average of the high and low estimates, 12,724,000, as determined in this study.

Data in the Bureau of Mines, Maryland and Virginia studies, items 2, 30, and 31, respectively, were examined on the same basis as those mentioned above. That is, a ratio of unprocessed cars to car registration for an area was developed and multiplied by the U.S. total registration to yield a number of unprocessed cars on a national basis. These estimates are developed below.

Present Study

Average of high and low estimates of vehicles in auto wrecker inventory and abandoned uncollected 1958-1970 = 12,740,000 vehicles

Mobile Auto Crushers Corporation of America-- Item 29, Appendix A

Abandoned uncollected + auto wrecker inventory + scrap processor inventory = 2,360,000

Total study area auto registration--1970 = 16,583,000

Ratio $\frac{2.36}{16.583}$ = 0.1424

1970 U.S. auto registration = 89,861,000

Ratio x Registration = 12,780,000

Average scrap processor inventory--1970 = 332,700

Abandoned uncollected + wrecker inventory = 12,447,300

Maryland Study--Item 30, Appendix A

Abandoned uncollected + auto wrecker inventory + scrap processor inventory--1967 = 179,800

Total study area auto registration--1967 = 1,401,000

Ratio $\frac{179,800}{1,401,000}$ = 0.1281

1967 U.S. auto registration = 80,059,000

Ratio x Registration = 10,160,000

Average scrap processor inventory--1967 = 344,500

Abandoned uncollected and auto wrecker inventory = 9,915,500

Average abandoned uncollected and auto wrecker inventory from present study--1967 = 8,215,500

Virginia Study--Item 31, Appendix A

Abandoned uncollected + auto wrecker inventory + scrap processor inventory--1968 = 286,000

Total study area auto registration--1968 = 1,711,000

Ratio $\frac{286,000}{1,711,000}$ = 0.167

1968 U.S. auto registration = 83,281,000

Ratio x Registration = 13,900,000

Average scrap processor inventory--1968 = 301,000

Abandoned uncollected and auto wrecker inventory = 13,599,000

Average abandoned uncollected and auto wrecker inventory from present study--1968 = 9,699,000

Bureau of Mines Study--Item 2, Appendix A

Abandoned uncollected + auto wrecker inventory + scrap processor inventory--1967 = 510,000

Total study area auto registration--1967 = 6,470,000

Ratio $\frac{510,000}{6,470,000}$ = 0.0788

1967 U.S. auto registration = 80,059,000

Ratio x Registration = 6,310,000

Average scrap processor inventory--1967 = 344,500

Abandoned uncollected and auto wrecker inventory = 5,965,500

Average abandoned uncollected and auto wrecker inventory from present study--1967 = 8,215,500

The estimates developed above for 1970 indicate that the average of the high and low estimates in the estimating procedure developed in Appendix C represents the approximate number of abandoned uncollected autos and auto wrecking industry inventory. The estimate of approximately 12.75 million cars however, must be further broken down to reflect the magnitude of the abandoned uncollected auto problem. The best estimate for the percentage distribution among auto wreckers' inventories and abandoned uncollected vehicles is found in the 1967 Bureau of Mines study, see item 2 Appendix A. Using the percentages from this study and adjusting them for the fact that scrap processor inventory has already been accounted for, the following distribution results:

Auto wrecking industry inventory = 77.6% x 12.75 million
= 9.9 million

Abandoned uncollected = 22.4% x 12.75 million
= 2.85 million

The trends for the years 1967 - 1970 show a rise in the number of unprocessed cars which may not be caused by increased abandonment. This increase in unprocessed cars shows that all vehicles are having problems entering the scrap processing and steel industries. In order to understand the trend in automotive scrap utilization, it is necessary to examine trends in steel production and all obsolete scrap utilization. This is discussed in section 8.

It is well at this point to go back and look at the abandoned vehicle problem. A large percentage of abandoned vehicles are regularly collected in urban areas and enter the scrap cycle. At present there is insufficient data to separate abandoned vehicles in the scrap cycle from vehicles that entered the cycle by normal channels. Although, by definition, they were "abandoned" by their owners, and although this study is intended to recommend strategies to cope with the abandonment problem, these collected vehicles do not create a permanent environmental problem. Only the vehicles for which no provision has been made for collection are a permanent eyesore. This is not to say that all are not a problem, but abandoned cars must be kept in proper perspective with those vehicles which do not enter the scrap cycle.

The actual number of uncollected abandoned automobiles is slightly lower than indicated above due to three factors:

- Some vehicles deregistered are held by owners for future repair and reregistration
- Some vehicles deregistered are exported by their owners
- Some vehicles are being used experimentally for landfill or artificial reefs.

Storage data is not available from state registrations. Only one state surveyed, Washington, had storage information as a result of a special study. The study indicated that 18.3 percent of the deregistrated vehicles in Washington were stored for future use. This figure seems high and probably represents those individuals who have all good intentions of restoring a vehicle but never seem to find the time and end up with several useless hulks on their property. Data on vehicles exported is likewise unavailable from either state or Federal sources. The third group of vehicles contained in the uncollected abandoned vehicle category are those vehicles used for landfill and artificial reefs. Auto bodies make poor landfill material, and the number used was not considered to be significantly large. Similarly, a significant number of autos do not find their way into U.S. waters as artificial reefs. In total, it is estimated that the above vehicles do not make a significant contribution to the figures derived from the number of uncollected abandoned automobiles.

In considering the distribution of uncollected abandoned vehicles on public and private property, land use characteristics must be examined. In cities, little room exists on private property to abandon vehicles, other than private garages, because of the presence of buildings. Private roads in cities are almost nonexistent. Publicly owned property, on the other hand, is made up primarily of municipally owned streets and is readily accessible to the abandoner. As determined by an earlier survey of 268 cities (see item 14, Appendix A) approximately four times as many vehicles were abandoned on public property as private property.

In rural areas the situation is reversed: most abandoned autos reside on private property. Again, this is due to land use characteristics. Private property constitutes the major portion of land area available on which to abandon autos. While the precise ratio was not determined due to the lack of data at state and local levels, a study conducted by the Department of the Interior, see item 2, Appendix A, shows this statement to be true. The ratio of abandonment on private property to public property in rural areas ranged from all on private property to 4. 1, in the areas investigated.

It was concluded that the bulk of the uncollected automobiles reside in rural areas on private property. This conclusion was reached from the fact that municipalities collect abandoned autos promptly. Over 90 percent are removed from public property within 10 days. The residence time on private property is somewhat higher due to problems of removal. This data was derived from a survey of 268 cities in 1967, (item 14, Appendix A) and was corroborated through interviews with, and a survey of, city officials, As a further indication, the Department of the Interior report cited above showed that abandoned autos on public property in rural areas were promptly collected but backlogs far in excess of those collected exist on private property.

An earlier study in the area of abandonment (see item 14, Appendix A) indicated the following reasons for abandonment:

.	Vehicle became inoperative	30%
.	Unwillingness to pay for disposal	25%
.	Ignorance of disposal procedure	25%
.	Loss of lien on title	10%
.	Other	10%
		100%

As shown above, economics plays an important role in abandonment. For inoperative vehicles, the owner probably could not afford to return the vehicle to an operating condition or the cost to do so was more than the vehicle was worth. In the second case above, the vehicle was probably also inoperative and required towing. Usually, the towing charge is not covered by the selling price of an older auto and, therefore, the owner must pay for its disposal. Economics, then, accounts for approximately 55 percent of the abandonment in urban areas.

Comparable data for rural areas does not exist. However, an indication that economics is an influencing factor was uncovered. Towing distances and hence towing charges are higher in rural areas than in urban areas. This fact, coupled with the availability of land makes the storage of unwanted vehicles on private property a more economically attractive alternative than paying for towing it to a disposal site. Economics therefore is the major cause of auto abandonment in both urban and rural areas.

6. RELATIONSHIP BETWEEN URBAN ABANDONMENT AND COLLECTION RATE AND URBAN VEHICLE DENSITY

Abandonment data was collected from eighteen (18) cities of varying size. In an effort to explain the differences in the number of vehicles abandoned as a function of the vehicle and population densities, a statistical analysis of variance scheme was employed. The quantities analyzed were:

- Abandonment and collection rate, which was defined as the number of vehicles abandoned divided by the number of vehicles registered in each urban area studied
- Urban vehicle density, which was defined as the number of registered vehicles divided by the number of people in each urban area studied.

In the first step in the analysis, a least-squares linear regression line was generated, based on the 18 sample values for the two items above. The urban vehicle density was chosen as the independent variable and the urban abandonment and collection rate was chosen as the dependent variable. The regression line provided an estimate of the expected abandonment and collection rate for any given urban vehicle density value. The sample of 18 values for both variables is shown in Table IV-1. A graphical representation of the least-squares linear regression line generated for these sample values appears in

Table IV-1
Abandonment and Collection Rates and Vehicle Densities for 18 Selected Urban Areas

Urban Area	Abandonment and Collection Rate	Vehicle Density
Baltimore, Maryland	.0039	.310
Goffstown, New Hampshire	.0029	.350
Austin, Texas	.0051	.364
Orem City, Utah	.0030	.370
Knoxville, Tennessee	.0030	.390
Grand Rapids, Michigan	.0037	.409
Boston, Massachusetts	.0021	.430
Anoka, Minnesota	.0010	.440
Denver, Colorado	.0054	.440
Dallas, Texas	.0039	.442
Riverside, California	.0051	.535
Minneapolis-St. Paul, Minn.	.0038	.572
Riverside/Imperial, California	.0046	.580
Burbank, California	.0047	.590
Long Beach, California	.0066	.675
Oklahoma City, Oklahoma	.0037	1.032
Detroit, Michigan	.0100	1.320
Dayton, Ohio	.0084	1.520

Figure IV-7. The amount of change in the abandonment and collection rate "explained" by changes in the urban vehicle density was found to be 57 percent. This statistic, often called the coefficient of determination, is generally accepted to be significant in cross-sectional samples of economic or demographic phenomena if its value is greater than 40 percent. Thus, the results obtained, which indicated that 57 percent of the variance of the abandonment and collection rates is explained by the linear influence of the urban vehicle density values, do tend to substantiate that the urban abandonment and collection rate is correlated with the urban vehicle density.

The hypothesis that no relationship exists between the two variables was also tested. The test used was based upon the F statistic. The hypothesis was rejected at the 99 percent level of significance, and thus tends to support the contention that there is a definite relationship between the two variables.

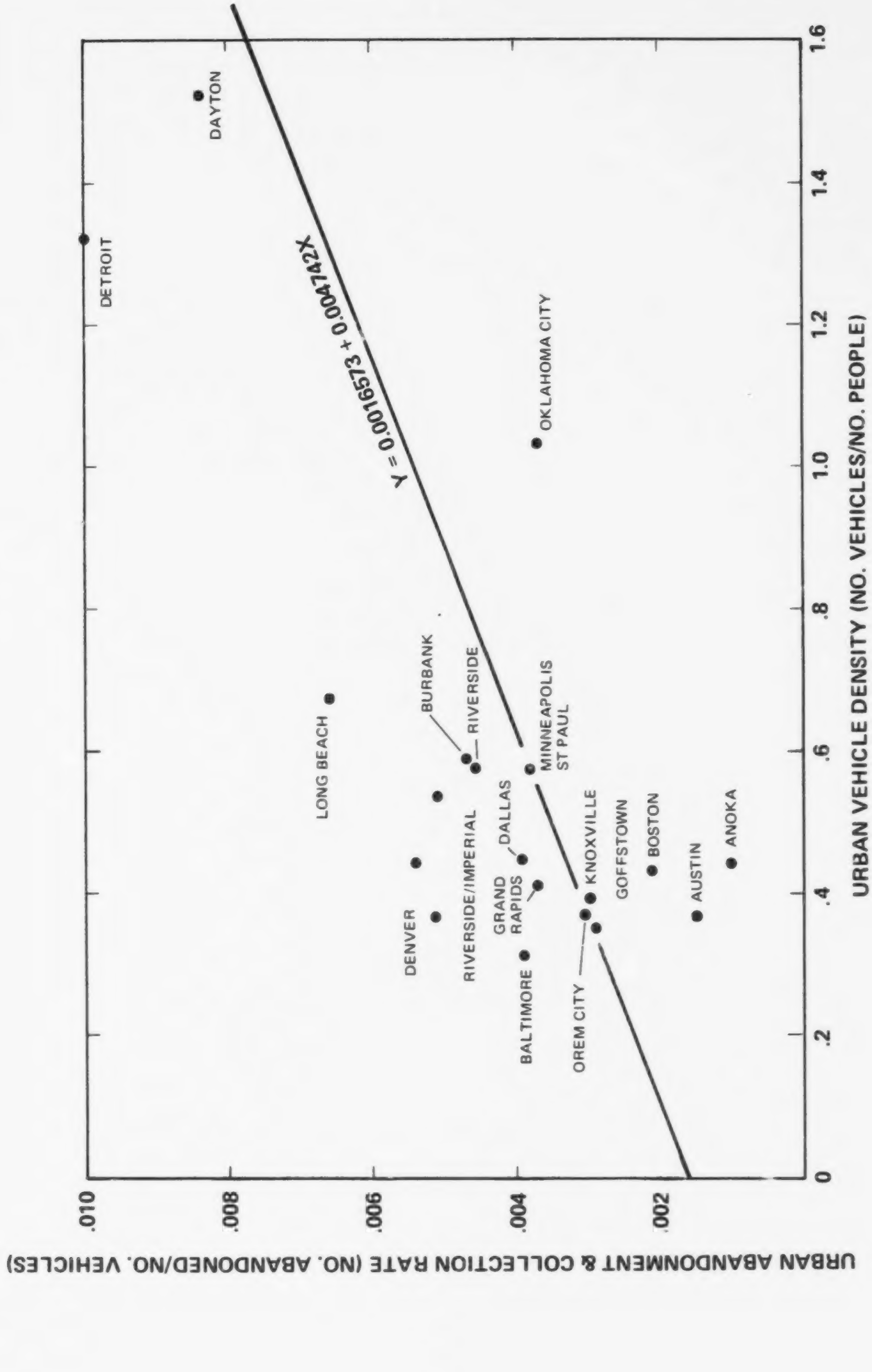
7. NUMBER AND CAPACITY OF AUTO WRECKING FIRMS

Auto wrecking firms, as stated earlier, are primarily in the used parts business. The primary limitation currently facing individual wreckers in urban areas is that of space. That is, their capacity to handle out-of-service vehicles is only limited by their ability to store vehicles. When space runs out, they must simply dispose of the excess to make room for new inventory. The general attitude of the industry is that they will accept all newer vehicles--5 years and newer--and will accept older ones if they can foresee a profit in it. Wreckers in urban areas where space is at a premium generally remove excess autos promptly from their yards. Wreckers in rural areas usually just expand their yards for additional inventory. The average length of time that wreckers hold cars is 12 to 18 months depending upon their geographic location.

Because of the lack of data at state and local licensing levels, an actual count of wreckers could not be obtained. However, by using data derived from the responses in the state survey, an estimate of this number was made. The number of wreckers per 1,000 of population was determined from the responses of 11 states. The estimating procedure is as follows:

- From Appendix B, State survey there were 7,400 auto wreckers in 11 states in 1970

FIGURE IV-7
Auto Abandonment Rates for
18 Urban Areas



- From an advanced report by the Bureau of the Census, the population of these 11 states in 1970 was 67,453,477
- Therefore, the number of wreckers per million of population is 109
- The total U.S. population in 1970 was 203,184,772 (from Bureau of the Census)
- Therefore, extrapolating on a national basis, the number of auto wreckers is 22,127.

8. NUMBER AND CAPACITY OF SCRAP PROCESSING FIRMS

In 1969, nearly 95 million tons of ferrous scrap was consumed by steel mills and foundries in the U.S. Fifty-seven million tons or approximately 60 percent of the ferrous scrap consumed was home scrap or mill revert, i.e., scrap produced by the mills and reused in the steel making process. The remainder of the scrap consumed, 37 million tons, was scrap purchased from the scrap industry. The ratio, 60 percent mill revert and 40 percent purchased scrap, has been relatively constant since 1946. In addition to the 37 million tons consumed in the U.S., 9 million tons were exported for a total of 46 million tons produced by the scrap industry.

Purchased scrap is made up of prompt industrial scrap and obsolete scrap. Prompt industrial scrap comes from various manufacturing processes and accounts for approximately 15 percent of the total scrap utilized or about 33.6 percent of the purchased scrap. Obsolete scrap, which contains junked autos, accounts for the remaining 66.4 percent of the purchased scrap.

Three grades of scrap, #2 bundles, automotive slab, and shredded scrap contain the bulk of the automotive scrap produced. In 1969, the automotive scrap contained in #2 bundles, shredded scrap, and automotive slab consumed in the U.S. and exported equalled between 4.4 and 5.2 million tons. Auto scrap, therefore, accounted for 9.5 percent to 11.3 percent of the purchased scrap and 4.2 percent to 5.0 percent of all scrap consumed. These percentages of automotive scrap in purchased scrap for 1969 are representative of prior years. They demonstrate the relatively small role that junked autos play in the scrap processing industry.

According to estimates by the Institute of Scrap Iron and Steel (ISIS) there are approximately 3,500 scrap processing firms in the United States. Of this number, 1,200 scrap processors account for most of the industry's processing equipment and 95 percent of the industry's scrap production. These processors are located in various parts of the country but usually concentrate in their primary market areas near steel mills, foundries, and sea ports.

In addition to determining the total number of processors and their capacity, efforts were made to obtain figures for the number and types of processing equipment used. The following figures are based upon an equipment survey conducted by ISIS in 1966 and updated in 1970:

.	Balers or hydraulic presses	1,500
.	Slabbers/hydraulic guillotine shears	500
.	Shredders	97 in U.S., 6 in Canada.

Not all of the processors with the above equipment will handle automotive scrap. For example, 5 of the 97 shredders handle prompt industrial scrap only.

Equipment investment ranges considerably among the above. Balers and shearers range from $150,000 to $500,000 while shredding equipment varies from $400,000 to $4,000,000. The differences can be linked to automation and processing capacity. Baling and shearing operations require some manual handling and output is at the mercy of the handler's skill. Shredding is primarily automated and it is relatively easy to predict the output. Shredding machines range from 12,000 to 250,000 tons/yr capacity with the majority in the 50,000 to 100,000 tons/yr range. If 75,000 tons/yr were chosen as an average, nearly 7 million tons or 8.25 million autos could be processed. All vehicles going out of service each year can be handled by the scrap processing industry.

An ISIS equipment survey in 1971 estimated shredder capacity at 5.2 million tons based on a 40-hour week. Balers can typically process one car every four minutes. The average baler can then process 600 cars per 40-hour week, or about 30,000 cars per year. The total capacity of the 1,500 balers would be 53 million tons per year.* The capacity of shears is measured in units of cuts per hour and can not be translated into a processing rate with current information.

The combined capability of shredders, balers and shears during a 40-hour week is considerably in excess of the current processing rate and represents no impediment to the flow of out-of-service vehicles.

9. SCRAP CONSUMERS

As shown in section 7, automotive scrap in obsolete scrap, represents about 1/20 of the total scrap utilized in 1969 and about 1/10 of scrap purchased by steel mills. If all the abandoned uncollected cars were to be made available to the scrap consumers, approximately 2.4 million tons or about one-half the 1969 consumption rate of automotive scrap would be available. Since such a cleanup would take place over a period of years, the quantities of scrap involved would likely have no significant effect on the scrap market.

The trend in scrap utilization is discussed in items 11, 27, and 28 of Appendix A in great detail and is summarized below.

Item 11, ISIS "Facts" projects on increased use of scrap in steelmaking up to 1980, a decrease to 1985 followed by an increase to 1999. Two opposing trends in steelmaking, increased use of pre-reduced ore lowering scrap utilization and increased use of electric furnaces raising scrap utilization, appear to negate each other with respect to scrap consumption.

Item 28, EPA "Economic and Technological Impediments to Recycling Obsolete Ferrous Solid Waste" concludes that the total amount of obsolete ferrous scrap not being utilized is increasing annually and that government intervention will probably be required to preserve our natural resources and increase the recycling of obsolete ferrous wastes.

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* In the estimating procedure 90 seconds for cycling or crushing a car was used. This time can be as low as 45 seconds. The 53 million tons then is a conservative estimate of the processing capacity. The figure can be as high as 65 million tons per year.

In the report "Identification of Opportunities For Increased Recycling of Ferrous Solid Waste," (Appendix A, item 28) it is concluded that several opportunities for recycling ferrous scrap exist but cooperation among scrap processors, steel makers, and government bodies is required to fully exploit the opportunities and remove obstacles.

10. TRENDS IN THE ABANDONED AUTOMOBILE PROBLEM

It is essential that trends be identified, insofar as possible, so that strategies recommended to combat the abandoned auto problem are consistent with anticipated future requirements. Figure IV-6 shows that the rate of change of unprocessed vehicles has been increasing steadily since 1967. This, in itself does not necessarily reflect an increase in abandoned vehicles. The best evidence regarding trends in abandonment rate comes from the large urban areas. The cities of New York and Chicago report increases in the abandonment rate each year for some time. New York City reported 2,500 car removals from public streets in 1960, 25,000 in 1967, 50,000 in 1969, 65,000 in 1970 and an estimated 80,000 in 1971. The Chicago Police Department reports 29,000 in 1960, 84,000 in 1969, and an estimated 100,000 in 1970.

The above vehicles represent a major problem to urban areas. However, it has been pointed out that all are collected and processed into scrap. They are collected, often at city expense, because they represent a public hazard or nuisance. They can generally be conveniently processed into scrap because the large urban areas are also the centers where large scrap processors are located, so that transportation costs are a minimum.

Although trend data from rural areas does not exist, it is reasonable to expect that these abandonments are increasing at least as fast as the number of vehicles retired from service (see Figure IV-2). The rural problem differs significantly from the urban problem, in that regular collection does not take place. The total number of vehicles involved is also significantly less, since rural registrations are significantly less than urban registrations (although no such breakdown is compiled by state DMVA's).

Thus, the magnitude of the abandoned auto problem appears to be steadily increasing, and some action is indicated both to reduce the abandonment rate and collect the backlog.

V. STRATEGY DEVELOPMENT AND EVALUATION

The purpose of this task was to develop and evaluate alternate solutions to mitigate the abandoned auto problem. The abandonment problem is twofold. First, there is the problem of existing accumulations that require removal and disposal. These accumulations total approximately 2.85 million autos, based on the estimates of Chapter IV, and reside mostly in rural areas. Second, there is the problem of preventing abandonment or promptly effecting the removal of newly abandoned autos to prevent the addition to the present backlog.

Alternate solutions that would implement the collection and disposal of existing accumulations were investigated. The alternate solutions were analyzed from the standpoint of cost, practicality, and their ability to overcome the impediments at various points in the scrap cycle as shown in Figure III-1. Originally it was the intent to simulate the various strategies and their impact on the scrap cycle mathematically in a dynamic model of the scrap cycle. After examination of existing data and the collection, and tabulation and analysis of the survey returns, it was determined that sufficient data was unavailable to construct a mathematical model to achieve the original intent. A model was developed to provide insight into the problem and is described in Chapter VI. However, the evaluation of the strategies was conducted individually on a cost vs. benefits basis.

This chapter describes current and proposed strategies, analyzes them with respect to effectiveness in removing impediments in the cycle, cost, and practicality, and recommends separate strategies to reduce abandonment and collect the backlog.

1. CURRENT STRATEGIES

Strategies exist at almost every state and local level to deal with collection, storage and disposal problems associated with abandoned autos. Some states/municipalities treat them as part of the overall solid waste disposal problem and make provisions for their removal, storage and disposal through solid waste disposal laws. Other states/municipalities consider them as public health and safety hazards, and use the hazard as the basis for collection. Still others consider them as impediments to the public right of way, and justify their collection, storage, and disposal through motor vehicle department/highway laws. Finally, some states/municipalities have instituted special programs and passed special laws that deal exclusively with the unique aspects of the abandoned auto problem.

Regardless of the title under which the laws appear, they are all basically the same. The following elements are common to most of the laws and ordinances reviewed:

- Definition of an abandoned auto
- Authorization and removal procedures
- Storage facilities
- Notification requirements
- Disposal procedures
- Re-titling requirements.

The first element is similar in most states/municipalities. The definition sets forth criteria by which to judge whether or not a vehicle has been abandoned. On public property, the definition includes a time limitation which may not be exceeded by a parked car. The limitation ranges from 2 to 30 days, depending upon the jurisdiction. On private property, the definition includes two time limitations: one, when the property owner's permission was given to park the car, and the other, when it was parked without the property owner's permission.

In addition to these time limitations, operability and registration are dealt with in the definition. An inoperable vehicle without a current registration, regardless of age and time limitations explained above, may be declared abandoned, and removed from public or private property.

The next element -- authorization and removal procedures -- includes ticketing and towing the auto to storage facilities. A vehicle thought to be abandoned on public property has a notification attached to it indicating that it will be removed by the authorities, unless removed by the owner within a certain time period. The notification may include a summons for illegal parking. Vehicles on private property are not usually ticketed but this depends upon the municipality or state.

The laws also specify by whom the vehicle may be removed. In most states, the laws authorize police or sanitation departments to contract with any private wrecking firm or garage to tow vehicles. One state, Washington, allows only bonded wreckers/haulers to remove vehicles. New York City ordinances provide for long-term, competitively-bid contracts with auto wreckers to tow illegally parked and abandoned autos.

In most states, motor vehicle laws authorize the establishment by municipalities of impounding lots. In addition to these lots, city/state officials are also authorized to contract with garages, auto wreckers or parking lot owners for the storage of impounded vehicles. In most large cities, contracting with private storage facility owners is a necessity due to overcrowding of municipal facilities and limited land availability for expansion.

Another element covered by the laws is disposal procedures. After a vehicle has been taken into custody, efforts are made to notify the owner of the vehicle. The extent of this effort is prescribed by the law. In all states responding to the survey except one, the owner, if identified, is notified by registered letter of the location of the vehicle. If the owner cannot be found, lienholders are then notified. If neither owner nor lienholder can be identified, the law usually requires that a description of the vehicle and intent to dispose of it be published in a newspaper generally circulated in the community in which the vehicle is impounded. In some municipalities (Chicago, for example) notification is dependent upon the age of the vehicle. If it is seven years or older, Chicago officials determine whether or not the vehicle was stolen. If it is not stolen, immediate disposal is authorized. It should be pointed out that all municipalities check stolen motor vehicle files during the collection and storage period.

As part of the disposal procedures, the length of time that the vehicle is stored is also prescribed by law. The time varies from state to state and may be as little as one day or as long as six months. Vehicle age and value sometimes play a role in the length of time a vehicle is stored. Some states establish a threshold dollar or age value for a vehicle which determines the length of time it must be stored prior to disposal.

The actual disposal itself can occur in several ways. Most states require a public auction to be held. Others contract with wreckers or scrap processors. The proceeds from the sale of the vehicles are used to pay removal and storage costs, with the remainder, if any, retained in a special fund to reimburse the owner or directed to the state treasury.

The final element of the laws/ordinances reviewed prescribe the type of documentation a purchaser of a municipally disposed vehicle must obtain. If a vehicle is operable or the purchaser intends to refurbish a vehicle for use on public highways, the state may require that the normal titling and registration procedures be followed at the time of purchase or at such time as the vehicle is fit for road use. When a vehicle is intended for scrap, a wide variety of requirements are imposed by the states.

Some states consider a bill of sale from the municipality/state to be adequate proof of ownership. Others supply the original title if available, or issue a temporary title at no charge to the purchaser. Some states require that this title be returned upon dismantling or other-wise processing the vehicle. Still other states require that the normal titling procedures be followed including the payment of titling fees.

The preceeding generally describes the current "impound and sell" approach to the abandoned auto collection, storage and disposal problems in effect in most states. In addition to the above, some states have adopted further means to deal with the problems. These programs are described below. It should be noted that the above approach is supported by state funds and proceeds from the sale of the vehicles. States adopting additional means to deal with the problems have, in some cases, provided additional funds to support these programs. Specific approaches taken by the States of Maryland and Vermont, and by New York City and Chicago are described below.

(1) Maryland

Maryland provides additional funds, $1 per title transaction or $650,000 in 1970, to be used as an incentive to auto wreckers and scrap processors to accept vehicles and prevent accumulations in wrecking yards. A $5.00 bounty is placed upon each car processed by auto wreckers and scrap processors. Upon submission to the state motor vehicle department of proof that a vehicle has been processed, both auto wrecker and scrap processor collect $5.00 for each auto processed through their yards. The vehicle must have been registered in Maryland at the time that it went out of service. The wreckers and processors may reside in the State of Maryland or neighboring states. In either case, they must possess a Maryland wrecking or scrap processing license.

The purpose of paying the bounty is to stimulate the flow of hulks through the industrial cycle by defraying transportation costs and giving additional value to hulks. By offering this bounty, it is hoped that there will be additional incentive to accept low-value cars, collect abandoned ones and process them into scrap. In 1970, $250,000 in bounties was paid to wreckers and processors.

The Maryland law also provides for a $300.00 fine to be levied on the abandoner, if caught. Further, a state inventory tax of $5.00 is levied on auto wreckers for each hulk over eight-years old and residing in the wrecker's inventory longer than one and one-half years. The tax is levied every six months after the initial one and one-half years has expired. The amount of money collected in fines and taxes by the state was not available. At the time of this writing, the state is considering extending the hulk age to ten years old, and paying an additional bounty of $5 per car to municipalities to stimulate their participation in the program.

(2) Vermont

The State of Vermont has adopted a program of transportation subsidies for the removal of abandoned auto backlogs scattered throughout the state. Upon notification by a county, the state agrees to hire an independent collector to crush and transport abandoned vehicles to a scrap processor. The assembly and preparation of the vehicles is done at the expense of the county. The county has the option of using its own equipment, contracting with individuals or using volunteer help in collecting and preparing the vehicles. A minimum of 200 vehicles is required to qualify for state assistance.

The state hires collectors on a competitive basis. It pays only for that additional mileage beyond which the collector can operate profitably. When scrap prices are sufficiently high, collectors will agree to pay the state for the salvage rights to the hulks. At times, therefore, the program can be nearly self-supporting.

In addition to paying for transportation of the hulks, the state also offers assistance in selecting the collection site and planning the collection/removal operation. Further, the state will share up to 75 percent of the county administrative costs. In the period 1968-1969, Vermont collected 13,151 cars at an average cost of $9.90 per car.

(3) New York City

The sanitation department of New York City offers eight contracts covering the five boroughs of New York City for competitive bid among auto wrecking firms. The services that the city contracts for are the collection of illegally parked vehicles, and the storage and disposal of abandoned vehicles. The day-to-day supervision is performed by sanitation department employees and authorization to collect the vehicles is given by the sanitation department.

Wreckers are required to remove vehicles within 48 hours of notification by the department. The vehicles are logged into the wreckers yard by the sanitation employees and a search for the owner is initiated. The wreckers are required to store the vehicles for a period of not less than five days while the owner search takes place. If the vehicle is claimed, the wrecker may charge up to $15.00 for towing and $2.00 per day storage. If the vehicle is unclaimed, the wrecker may strip it of parts and dispose of the hulk. During 1971, 80,000 abandoned vehicles in New York City were disposed of in this manner at an average cost of $2.57 per car.

(4) Chicago

Chicago's program is similar in most respects to the impound-and-sell programs currently in existence in most states. The unique feature of the program is the notification procedure. A vehicle is determined to be abandoned in accordance with the following abandoned vehicle definition:

- "...any motor vehicle which has not been moved or used for more than seven consecutive days and is apparently deserted shall be presumed to have been abandoned."
- "...is in such a state of disrepair as to be impractical to use as a motor vehicle."

- "...has no motor, transmission, or other major component parts."
- "...has been manufactured seven or more years previous to the current year."
- "...is valued at less than $100.00."

The owner is not notified if the vehicle is:

- Over seven years old and no title or junk certificate* is available
- Between six and seven-years old, with a junk certificate
- Under six-years old with a certificate of Purchase to the highest bidder at public auction.

The short circuiting of the usual notification procedures thus reduces administrative time and cost in dealing with the problem. In 1969, Chicago collected approximately 84,000 vehicles at a cost of approximately $9 per vehicle.

2. PROPOSED ALTERNATE STRATEGIES

A variety of direct and indirect strategies aimed at the prevention of abandonment or collection of the abandoned auto backlog have been proposed. Figure V-1 shows a classification scheme for categorizing these alternatives. The balance of this section describes the strategies. The first and second strategies discussed below were submitted as two bills before the Subcommittee on Air and Water Pollution of the Committee on Public Works during August, 1970.

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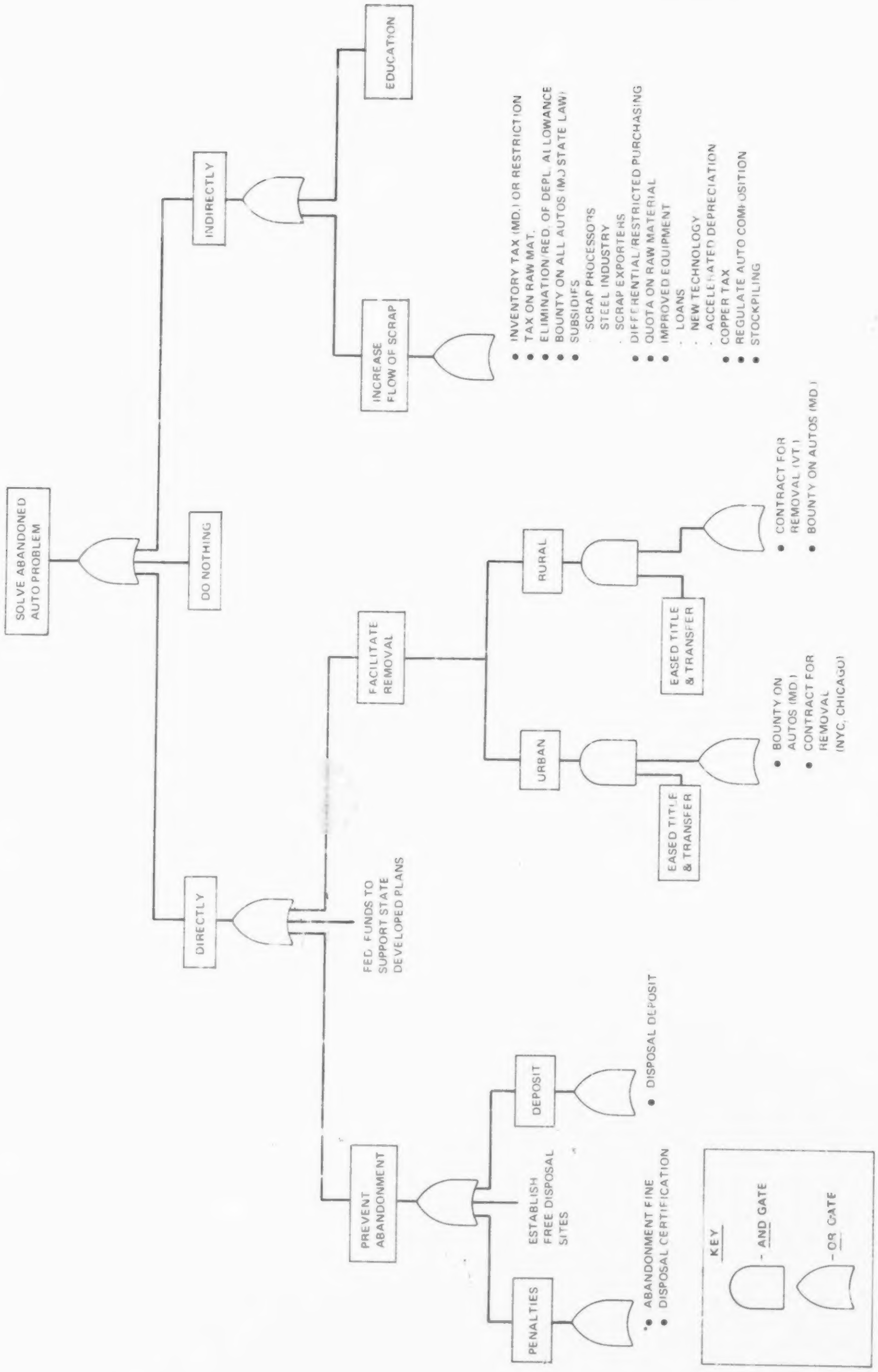
* A "junk certificate" is affixed to a vehicle in lieu of a title if unavailable when a private citizen surrenders a vehicle to the city for disposal.

FIGURE V-1
Strategy Elements for
Mitigating the Problem


SOLVE ABANDONED AUTO PROBLEM
DIRECTLY
DO NOTHING
INDIRECTLY
INCREASE FLOW OF SCRAP
EDUCATION
• INVENTORY TAX (MD.) OR RESTRICTION
• TAX ON RAW MAT.
• ELIMINATION/RED. OF DEPL. ALLOWANCE
• BOUNTY ON ALL AUTOS (MD STATE LAW)
• SUBSIDIES
. SCRAP PROCESSORS
. STEEL INDUSTRY
. SCRAP EXPORTERS
• DIFFERENTIAL/RESTRICTED PURCHASING
• QUOTA ON RAW MATERIAL
• IMPROVED EQUIPMENT
. LOANS
. NEW TECHNOLOGY
. ACCELERATED DEPRECIATION
• COPPER TAX
• REGULATE AUTO COMPOSITION
• STOCKPILING
FED. FUNDS TO SUPPORT STATE DEVELOPED PLANS
FACILITATE REMOVAL
URBAN
EASED TITLE & TRANSFER
• BOUNTY ON AUTOS (MD)
• CONTRACT FOR REMOVAL (NYC, CHICAGO)
RURAL
EASED TITLE & TRANSFER
• CONTRACT FOR REMOVAL (VT)
• BOUNTY ON AUTOS (MD)
PREVENT ABANDONMENT
PENALTIES
• ABANDONMENT FINE
• DISPOSAL CERTIFICATION
ESTABLISH FREE DISPOSAL SITES
DEPOSIT
• DISPOSAL DEPOSIT
KEY
- AND GATE
- OR GATE

(1) Disposal Fee on All Autos

The Motor Vehicle Disposal Act (S. 4204) proposed that all vehicle owners' deposit $25 to $50 into a Motor Vehicle Disposal Fund to be established in the U.S. Treasury and administered by the Secretary of the Department of Transportation. The fee would be payable within three months after the establishment of the fund. A receipt, to be affixed to a vehicle, would be issued. The fee would be refunded to the final owner when the vehicle is retired to an auto wrecker's or scrap processor's yard. Further, the proposal includes the establishment of a National Motor Vehicle Disposal Council to advise the Secretary on the administration of the program, licensing of all wreckers and scrap processors, and reimbursing scrap processors from $1 to $5 for the costs of keeping vehicle retirement records.

As a vehicle is passed from owner to owner, the fee would be included in the selling price of the car. Finally, when the vehicle is taken out of service, the last owner would obtain a receipt indicating its retirement from an auto wrecker or scrap processor. Upon submission of the two receipts, the disposal fee and retirement receipts, to the administering agency, the final owner would receive the disposal deposit of $25 to $50. Because the vehicle would always have at least the value of the disposal fee, there would be an incentive to dispose of it within the industrial flow rather than abandon it. If a vehicle were abandoned, the program specifies that the individual organization submitting the vehicle for proper disposal would collect the disposal fee. Thus, an incentive to collect abandoned vehicles with the affixed disposal fee receipt would be created. The fund set up under this program would collect approximately $4.7 billion based upon estimated 1972 registrations.

(2) Federal Assistance to States

The Motor Vehicle Disposal Assistance Act (S. 4197) proposed to allow each state to submit a program dealing with the collection, storage and disposal of abandoned autos. The bill would provide funds to states that develop and implement abandoned auto programs. Under this program, states would submit their proposed approaches to the Secretary of Health, Education and Welfare for his review and approval. Upon approval, a state would be eligible to receive Federal assistance to implement its program. The amount allotted to each state would come from a $20 million appropriation for FY's 71-74 and would be proportional to the state's motor vehicle population. The states would be required to furnish the manpower and funds to support administrative functions and to make periodic status reports to the Secretary of HEW.

(3) Establish Free Disposal Sites

It has been proposed that disposal sites operated by a public authority be established. These sites would provide areas where vehicle owners could dispose of their unwanted vehicles at no direct cost or fee. Establishment of the sites would be state financed.

This approach is currently in effect in over 25 percent of the municipalities contacted during this study. Some respondents indicated that the existence of these sites did not seem to reduce incidences of abandonment nor was there widespread use of these sites by private citizens.

(4) Disposal Certification

This approach would require a vehicle owner to submit proof of sale or transfer of a vehicle to registration/titling authorities. Currently in all states, registration renewal documents are sent by the Department of Motor Vehicles to citizens having a vehicle licensed in the state in which they reside with instructions to discard the renewal document if the vehicle has been disposed. Under this program, a citizen who has disposed of a vehicle would be required to return the document, rather than discard it, with a copy of the vehicle transfer document (copy of bill of sale, title transfer, etc.). Upon receipt of proof of disposal, the titling/registration authorities would purge the vehicle owner's name from current registration files. Upon failure to submit proof of disposal, the owner's name would be placed on a list of restricted registrants for a period of time that could range from one to five years. If a citizen who has not submitted proof of disposal attempted to register another vehicle in the same state, registration of that vehicle would be denied until such time as he/she had submitted proof of disposal or payed a fine in an amount to be determined by the state. This requirement for disposal certification would thus motivate vehicle owners to responsibly dispose of their vehicles.

(5) Eased Title and Transfer Requirements for Retired Vehicles

Under this approach, abandoned vehicles whose value is less than $100 and whose age is greater than seven model years could be disposed of by municipalities without lengthy storage requirements and notification procedures. This would somewhat relieve the burdensome administrative requirements for owner notification. Further, purchasers of these vehicles intending to process them into scrap would not be required to acquire new titles. The bill of sale would be considered adequate proof of ownership.

(6) Inventory Tax or Restriction

This approach is intended to reduce existing inventories of hulks in auto wrecking and scrap processing yards by imposing an inventory tax or prohibiting the accumulation of hulks. The tax or restriction could establish a minimum flow of vehicles through the scrap cycle. This approach would serve to limit wreckers' inventories and thereby improve the aesthetics of wrecking yards, but would not serve to comparably increase scrap demand by ultimate users.

(7) Tax or Quota on Raw Material

To a degree, ferrous scrap competes with virgin iron ore in the production of steel. This strategy proposes the imposition of a tax or restriction on the use of iron ore. The higher cost or restricted availability of iron ore would therefore increase the utilization of scrap in steel production (obviously within the limits allowable for the various steel making furnaces).

(8) Elimination/Reduction of Depletion Allowance

This approach would reduce or eliminate the depletion allowance currently enjoyed by virgin iron ore. This action would effectively increase the acquisition price of virgin material, making scrap a more economically attractive alternate for use in steel production.

(9) Subsidies

It has been proposed that subsidies be applied at the following points in the scrap cycle to increase the flow and utilization of scrap.

- Steel Industry - Steel mills would be either paid directly by the government or be permitted a tax exemption for the use of scrap in preference to ore. Additional recycling of ferrous scrap would therefore become more economically attractive to the steel industry.
- Scrap Processors - Scrap processors would be subsidized by the government by means of tax exemptions or direct payment for all auto scrap processed. Processors would be able to purchase hulks from wreckers at higher prices and during a time of low scrap demand, processors could sell it at a lower price while still maintaining their profit margin.
- Auto Wreckers - Auto wreckers would be subsidized to collect, store and dispose of all abandoned autos. The subsidy would pay for the costs of transporting, storing and preparing the hulk for processing into scrap.
- Scrap Exporters - Scrap exporters could be subsidized to encourage the flow of scrap and broaden the second market for scrap when its demand is low in this country.

(10) Differential/Restricted Purchasing

Under this plan, the Federal government would offer higher prices or restrict their purchases to only those steel products made entirely of, or having a high scrap content. This discriminatory purchasing policy would increase the demand for steel product's with a high scrap content and therefore, increase the demand for scrap.

(11) Improved Equipment

It has been proposed that scrap processing equipment be upgraded to increase the quality of scrap and its competitive position with virgin ore. Upgrading equipment at the scrap processing industry and/or the steel industry can be accomplished in the following ways:

- Loans - Scrap processors would be offered low interest loans to acquire equipment such as shredders, magnetic separators, air elutriation units, incinerators, which can be used to upgrade the quality of scrap. The steel industry would be offered low interest loans to invest in electric furnaces.
- New Technology - Research and develop funds would be made available to the steel industry to develop equipment that would use high scrap charges in steel making. Scrap processors would have funds to develop equipment capable of removing contaminants in automotive scrap.
- Accelerated Depreciation - As a means of encouraging both processors and steel makers to invest in the latest scrap processing equipment, accelerated depreciation schedules would be developed.

(12) Copper Tax

The presence of copper contaminants in automotive scrap is one of the major drawbacks to its use in steel production. This approach would tax auto manufacturers for using copper in major components and accessories. The quality of automotive scrap would be thus upgraded and its utility would increase.

(13) Regulate Auto Composition

Through the imposition of automobile design standards, the use of certain materials would be restricted and/or encouraged to make the vehicles more easily recycled.

(14) Stockpiling

Under this plan, the Federal or state governments would assume the responsibility for collecting and storing abandoned vehicles. To a certain extent, this plan is already in effect in those states/municipalities surveyed. Taxpayers already assume the burden of abandoned auto collection, storage and disposal.

(15) Do Nothing

This strategy would allow the present situation to continue with no Federal intervention and the development of state/municipal programs at the discretion of local governments.

(16) Education

Education, as a supplement to any strategy, has been proposed. A campaign-type of educational effort to increase consumer awareness of the proper disposal means and the consequences of the failure to do so could be part of an overall strategy to alleviate the abandoned auto problem. The effort could take place at all levels of government.

3. EVALUATION CRITERIA

The basic objectives of present and proposed solutions to the abandoned auto problem have been variously stated as being:

- The protection and preservation of public health and safety
- The protection and preservation of public right of way
- The protection and preservation of the environment.

These are certainly the most important overall objectives of any approach to the problem but do little to assist in evaluating the myriad of current and proposed solutions. To fill this gap, criteria were developed that deal with the economics of proposed solutions and the disparity of the abandoned auto problem in urban and rural communities. Six primary criteria are used to assess the alternate strategies.

(1) Does the Strategy Contribute to the Removal of the Existing Backlog of Abandoned Autos?

Abandoned autos accumulate on public and private property and, after collection, within storage areas. These accumulations represent waste of the unused steel, the land area where the vehicles are abandoned, and the investment in storage areas. Because abandoned autos are protected by the same property laws as other autos, these accumulations are sometimes difficult to remove. While continuing to recognize the rights associated with personal property, the overall strategy should include expedience in dealing with existing accumulations.

(2) Does the Strategy Serve to Prevent Abandonment?

In the interests of preserving the environment and promoting the reclamation of resources, the overall strategy should include means to prevent or minimize incidents of abandonment.

(3) What is the Economic Impact of the Strategy on Existing Entities in the Scrap Cycle?

The entities referred to are individual/fleet car owners, new/used car dealers, auto manufacturers, scrap processors/exporters, auto wreckers, iron/steel manufacturers, and railroad/trucking companies. There currently exists a balance in the economics of each of these entities. Any proposed strategy dealing with the abandonment problem should have a minimum impact on this economic balance.

In addition to the entities enumerated above, administrators of abandoned auto programs are also included. The overall strategy should consider alleviating the administrative burden involved in collecting, storing, and disposing of abandoned autos.

(4) Does the Strategy Provide Flexibility in Handling Both Urban and Rural Problems?

The abandoned auto collection problem has been solved in some of the larger cities. The necessity to keep heavily traveled streets and highways free and clear of all debris has necessitated the solution. As other cities face a debris/traffic congestion problem, they may be expected to follow suit in finding various solutions.

Rural areas, on the other hand, do not face a traffic congestion problem arising from abandoned autos because there is adequate space, other than roads and highways, on which to abandon autos. The overall strategy should, therefore, consider the different collection, storage and disposal needs of urban and rural communities.

(5) Are Collection Strategies Flexible in Providing Rapid Start-up and Phase-out?

The discussion of the second objective emphasized the need to collect existing accumulations. Therefore, the overall strategy should be capable of being implemented rapidly to begin the clean up.

As the backlogs are cleaned up, it would be expected that only current abandonment problems would have to be handled. This would lead to a lower level of activity than during the initial implementation. In order to avoid the establishment of a ponderous program that operates efficiently only at a high activity level, the overall strategy should be capable of operating at a scaled down level or to be partially inactive for a period of time.

(6) Does the Strategy Serve to Remove Other Impediments to The Flow of Abandoned Vehicles Through the Scrap Cycle?

Impediments to the flow of abandoned autos exist at various points in the auto scrap cycle. The overall strategy dealing with abandonment should include means whereby these impediments are overcome.

4. STRATEGY EVALUATION

The spectrum of strategies currently in use or proposed were displayed in the logic diagram of Figure V-1. They fall into three general categories: direct, indirect, and "do nothing." Direct strategies either prevent abandonment or facilitate removal of abandoned cars but not both. Indirect strategies are either educational or help to increase the overall flow of and demand for scrap. The latter is intended to create an increased demand for auto hulks (and other scrap).

The strategies were evaluated against the criteria set forth above and are summarized on Table V-1. In the evaluation discussion that follows, actual program costs on a per car basis are included where they were available. In the case of proposed strategies, estimates of the magnitude of the anticipated costs were developed.

(1) Require Each Vehicle Owner to Deposit $50 into a Vehicle Disposal Fund

The deposit would be included in the selling price of an auto and refunded to the final owner upon disposal of the vehicle. (Deposit for new vehicles only has been omitted because it would not be effective until approximately 5 years after the establishment of the fund.) This strategy was proposed in Senate bill S. 4204.

1. Costs

Costs are estimated on an annual basis for the year 1969 as follows:

- Cars in use January 1, 1969 - 73,941,518 private passenger cars
- Fund at the beginning of 1969 = $3.70 Billion
- New cars added by end of 1969 = 9,527,000
- Add new deposits = $.48 Billion
- Number of cars retired = 7,460,000
- Money removed from fund by end of 1969 (retirements) = $.37 Billion
- Interest on fund for one year (6%) = $.22 Billion
- Administrative costs - Bill provides for reimbursing scrap processors $1-5 per car to keep retirement records. Federal administrative costs estimated to be comparable. Total annual cost = $16-80 Million.

Table V-1
Criteria for Evaluation of Strategy Elements
Page 1 of 3

Strategy	Criteria					
	1	2	3	4	5	6
1. Impose a refundable disposal tax on all cars	No	Yes	High	No	No	Yes Economics
2. Federal assistance to States	Not a strategy in itself, but a means of supporting specific state/ local strategies.					
3. Establish free disposal sites	No	Partial	Small	No	No	Yes Economic to some extent
4. Require vehicle owners to furnish a disposal certification upon failure to re-register	No	Yes	Small (Admin. expense only)	Yes	No	Yes Ignorance
5. Ease the title, transfer, and notification laws associated with abandoned vehicles	Yes	No	Reduces collection costs	Yes	No	Yes Storage time & disposal methods
6. Inventory tax or restriction	No	No	No	No	No	No
7. Impose a quota on importation, mining, transportation or use of iron ore	Doubtful	Doubtful	Unknown	No	No	Yes Scrap demand
8. Eliminate or reduce depletion allowance	Doubtful	Doubtful	Unknown	No	No	Yes Scrap demand

LEGEND:
1 - Remove Backlog
2 - Prevent Abandonment
3 - Economic Impact
4 - Flexibility
5 - Response
6 - Removal of Impediments

Table V-1
Page 2 of 3

Strategy	Criteria					
	1	2	3	4	5	6
9. Subsidize processing of auto scrap at scrap processing yards	Slight help	No	Uncertain	No	No	Yes Transportation (all autos)
Subsidize iron and steel industry for increased use of scrap	Doubtful	No	Uncertain	No	No	Yes Demand (all scrap)
Subsidize scrap exporters	No	No	Uncertain	No	No	Yes Demand (all scrap)
Impose a tax on raw materials, i.e., iron ore	No	No	Uncertain	No	No	Yes Demand (all scrap)
10. Federal Government to establish a policy of differential price or restricted purchasing	No	No	Uncertain	No	No	Yes Demand (all scrap)
11. New equipment low interest loans	No	No	Uncertain	No	No	Yes Contaminants (all scrap)
New technology	No	No	Unknown	No	No	Yes Contaminants (all scrap)
Accelerated depreciation schedules	No	No	Unknown	No	No	Yes Economics (all scrap)

LEGEND:
1 - Remove Backlog
2 - Prevent Abandonment
3 - Economic Impact
4 - Flexibility
5 - Response
6 - Removal of Impediments

Table V-1
Page 3 of 3

Strategy	Criteria					
	1	2	3	4	5	6
12. Impose a copper tax on new autos	No	No	Low	No	No	Yes Contaminants (all autos)
13. Regulate the composition of new autos	No	No	High	No	No	Yes Contaminants (all autos)
14. Government collection and stockpiling of abandoned autos	Yes	No	Uncertain	Yes	No	No
15. Do nothing	No	No	None	No	No	No
16. Educational program	No	No	Low	No	No	Yes Ignorance
17. Place a fixed bounty on all cars processed by auto wreckers and scrap processors (Md. program)	Yes	No	Function of Bounty	No	Yes	Yes Economics (all autos)
18. Transfer salvage rights of abandoned autos to auto wreckers (collection, storage, & disposal - NYC program)	Yes	No	Low	Yes	Yes	Yes Transportation
19. Subsidize the transportation of abandoned autos from the abandonment site to a disposal site (Vermont program)	Yes	No	$1-10	Yes	Yes	Yes Transportation

LEGEND:
1 - Remove Backlog
2 - Prevent Abandonment
3 - Economic Impact
4 - Flexibility
5 - Response
6 - Removal of Impediments

- Summary of costs

  - Additions to Fund

Principal	3.70 Billion
New Deposits	.48 Billion
Interest	.22 Billion
Subtotal	4.40 Billion

  - Deletion from Fund

Admin Costs (average)	.05 Billion
Returned Deposits	.37 Billion
Balance at end of first year	3.98 Billion

The actual program cost is the $50 million administrative expense. However, some would consider the annual cost to taxpayers as the lost interest on the $50 deposit, $220,000,000 even though such interest may accrue to the Federal government. The cost per abandoned auto is dependent upon the effectiveness of the program, which is expected to be excellent, since collection would be effective in all but those areas where collection costs exceed the value of the deposit. If 100 percent effective in preventing abandonment, the cost per unit would be approximately $100 based on consideration of the administrative expenses alone, or $440 based upon the lost interest (assuming about 500,000 vehicles abandoned per year).

2. Criteria Comparison

(1) Remove Existing Accumulation. This strategy is aimed at the prevention of future abandonments and does not therefore meet this criteria. The interest from the fund however could be used for this purpose.

(2) Prevent Abandonment. Since this strategy gives every hulk an intrinsic value which generally will exceed any removal costs, it is expected to be extremely effective in both preventing abandonment and assuring prompt collection of any abandoned vehicles. A vehicle would be worth $50 to the owner regardless of mechanical condition.

It would be expected that an owner would prefer to redeem the money rather than lose it and face possible prosecution for abandonment.

(3) Minimize Impact on Economics. This strategy would add 3.7 billion dollars to the value of the 80 million vehicle fleet in the country. Most citizens owning a car for most of their adult lives would consider the $50 per car or $3.7 billion a direct and real cost, since the money would not be returned until they stopped owning a car. Another way of looking at the cost would be to consider the $220 million annual loss in interest to automobile owners. However one looks at this cost, it is high compared to other strategies considered to prevent abandonment and stimulate collection.

(4) Flexibility. The requirement for a disposal deposit would be uniform throughout the United States and does not recognize any disparity in urban and rural problems.

(5) Rapid Start-up and Phase-out. The program would be a continuing program. It is estimated that to start up and run such a program at least one year would be required. Suspension of the program would require an act of Congress.

(6) Remove Impediments. This approach increases the value of a car to $50 regardless of its mechanical condition thus removing a major impediment in the cycle. The (see Figure III-1, item 1) problem of low parts value to an auto wrecker for older cars and most abandoned vehicles still however remains.

(2) Federal Assistance to States

This approach would allow each state to develop a program in accordance with its own needs. The Federal government upon approval of each program, would assist the states through Federal grants. Since it does not directly affect specific problems of abandonment, it is not discussed further.

(3) Establish Free Disposal Sites

Sites would be made available to the public where unwanted vehicles could be disposed. There would be no direct cost to the citizens availing themselves of this service. The sites would be selected and maintained in municipalities at state expense.

1. Cost

The costs associated with this approach are difficult to assess because of the wide range of land prices throughout the country. Further, the number of sites and therefore the number of employees required to maintain the sites is equally difficult to determine.

The following estimate is based upon a requirement to store 500,000 vehicles at any one time on a national basis.

Area required per car		108 square feet
Access area required		52 square feet
		160 square feet
Total area required 160 x 500,000	=	80 million square feet or 20,000 acres
Land acquisition and preparation costs (assuming $4-6,000 per acre)		$80-120 million
Total Investment	~	$100 million
Annual operating costs (at $100,000 per year per site maximum)		$5 million
Total annual cost		
Amortize investment over 20 years		$5 million
Annual operating		$5 million
		$10 million

(4) Disposal Certification

Under this plan, an owner taking a vehicle out-of-service would be denied registration of another vehicle, or required to submit a fine upon failure to prove that the retired vehicle was transfered to another individual or responsibly disposed of in the scrap cycle. The logic of the state vehicle registration process is shown in Figure V-2. A list of restricted registrants is compiled of those who do not re-register their vehicles, and do not furnish proof of disposal of their old vehicles. New registration applications are matched against this list, and the applications are rejected until either proof of disposal is furnished or a fine paid. Legal precedent for such fines exist in several areas.

1. Cost

The costs incurred are the costs of establishing and maintaining a restricted registrant list at the State Department of Motor Vehicles and cross checking the list when processing new vehicle registration. Currently, the State of Maryland is supporting its bounty program, which includes the maintenance of a list of all retired vehicles and checking this list when paying wreckers and processors a $5/car bounty derived from $1/title transaction.* The income to this fund was $650,000 in 1970, representing 650,000 title transactions out of a total vehicles population of 1,638,000. Bounties paid totaled $250,000 but administrative expenses for the operation were not accounted for separately. It is estimated that data processing and administrative costs would range from 10 to 20 percent of the fund or $65,000-$130,000 per year, and further that these costs are representative of those to be exp expected in the disposal certification program. This cost is $0.04-$0.08 per vehicle registration. Extrapolating to a national basis, administrative costs would be about $3-$6 million per year. Based on 500,000 abandoned vehicles, the cost per abandoned vehicle prevented would be $6-$12.

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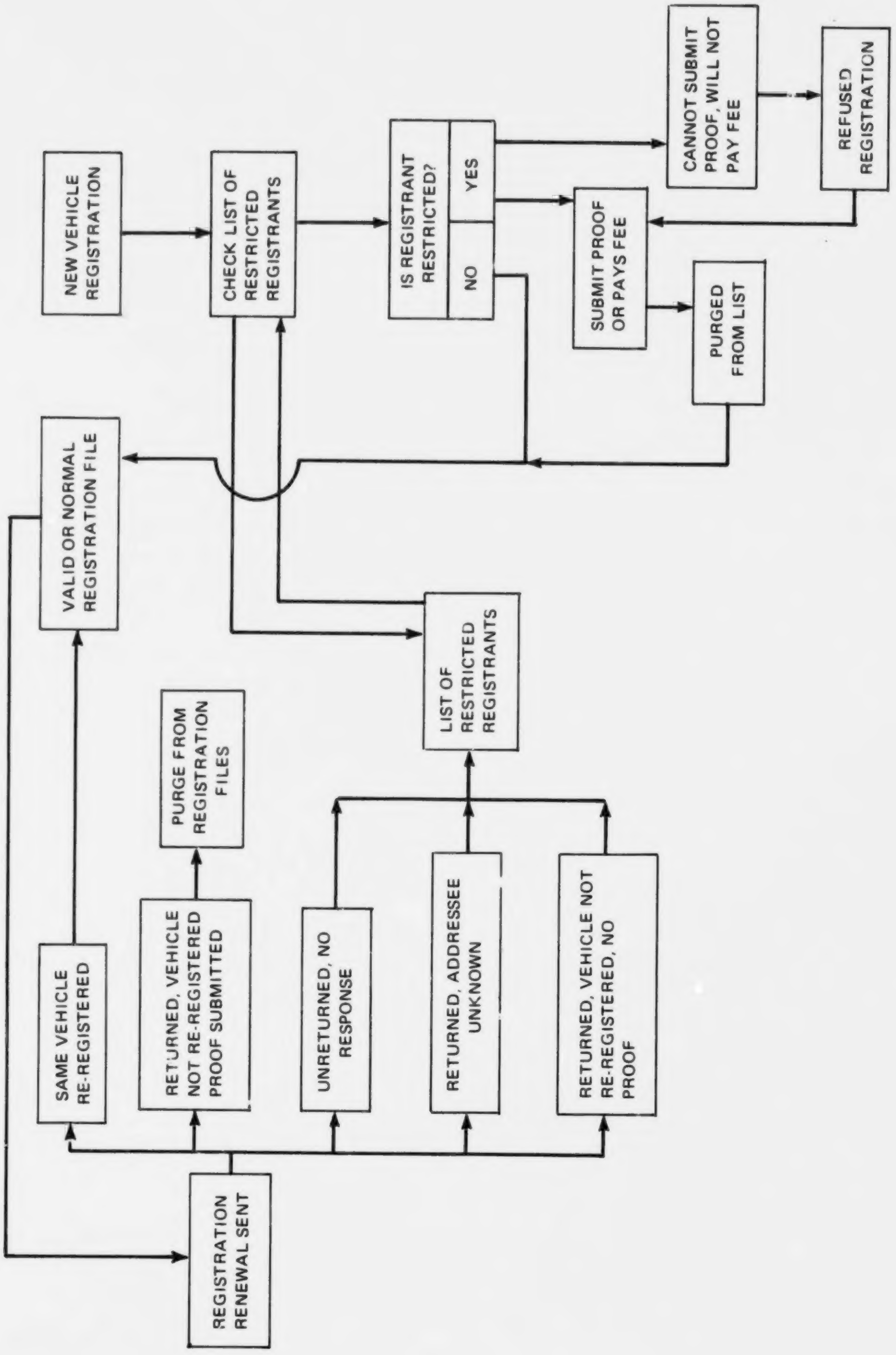
* A title transaction takes place only when vehicles are bought and sold.

FIGURE V-2
Disposal Certification
Logic Diagram


NEW VEHICLE REGISTRATION
CHECK LIST OF RESTRICTED REGISTRANTS
IS REGISTRANT RESTRICTED?
YES
NO
CANNOT SUBMIT PROOF, WILL NOT PAY FEE
REFUSED REGISTRATION
SUBMIT PROOF OR PAYS FEE
PURGED FROM LIST
VALID OR NORMAL REGISTRATION FILE
LIST OF RESTRICTED REGISTRANTS
PURGE FROM REGISTRATION FILES
SAME VEHICLE RE-REGISTERED
RETURNED, VEHICLE NOT RE-REGISTERED PROOF SUBMITTED
UNRETURNED, NO RESPONSE
RETURNED, ADDRESSEE UNKNOWN
RETURNED, VEHICLE NOT RE-REGISTERED, NO PROOF
REGISTRATION RENEWAL SENT

2. Criteria Comparison

(1) Remove Existing Accumulations. This strategy is designed to prevent abandonment and does not address the problem of existing accumulations. Fines collected under this program could, however, be used for this purpose.

(2) Prevent Abandonment. This strategy would act as a deterrent to abandonment by the fact that an owner would be denied future registration of a vehicle or would be required to pay a fine as a condition of future registration. The strategy has one weak point in that abandoners assuming residence in another state would not be identified due to the lack of current vehicle registration data exchange among states. This problem would be solved if the Department of Transportation's uniform vehicle registration/titling program was adopted.

(3) Minimize Impact on Economics. The overall impact of this strategy would save municipalities the cost of abandoned auto law enforcement. This saving would accrue from the fact that the burden of proof is on the vehicle owner and not upon law enforcement agencies. In fact, law enforcement officials would not enter into that aspect of the problem since denial of registration and collection of fines would be handled by the Department of Motor Vehicles.

(4) Flexibility. The requirement to dispose of a vehicle responsibly is not geographically oriented and therefore this approach is applicable to urban and rural areas.

(5) Rapid Start-up and Phase-out. This program would require approximately one year to implement and would be a continuing program.

(6) Remove Impediments. This strategy is designed to emphasize the need for responsible vehicle disposal by owners. It does not remove

any technical impediments in the scrap cycle, but provides an owner incentive to see that proper disposal of his vehicle is achieved.

(5) Eased Title and Transfer Requirements for Retired Vehicles

This strategy would relieve the administrative burden of notification procedures and reduce acquisition costs and time to wreckers/processors. It has been previously proposed many times and has already been adopted by many municipalities. It does not, in itself, affect abandonment, but aids significantly in facilitating the collection process.

1. Costs

There would be no continuing costs involved in this strategy. The only costs incurred would be those associated with changing existing legislation and are considered negligible.

2. Criteria Comparison

(1) Remove Existing Accumulations. While this strategy does not directly affect vehicle removal, it does simplify the administrative burden associated with the removal of abandoned autos. It reduces storage time at municipal impounding lots and reduces the cost to the purchasers.

(2) Prevent Abandonment. This strategy facilitates the removal of abandoned autos but does not prevent abandonment.

(3) Minimize Impact on Economics. The strategy does not incur any continuing costs and results in a cost savings to both municipalities and purchasers of abandoned autos.

(4) Flexibility. This approach would be applicable to both urban and rural areas.

(5) Rapid Start-up and Phase-out. It is estimated that three to four months would be required to change current registration/titling laws in each state. This would be a continuing program and would not be phased out.

(6) Remove Impediments

This strategy removes the notification and storage impediments in the scrap cycle as illustrated in Figure III-1 (point 5).

(6) Inventory Tax or Restriction on Wreckers and Processors

This strategy is geared to establish a minimum flow of vehicles through the cycle and relieve the aesthetic problem of wrecking and processing yards, by penalizing wreckers and processors for keeping hulks unnecessarily long. It does not appear to have any effect on abandonment or abandoned vehicle collection, since the vehicles taxed can be expected to have almost no parts value anyway.

1. Cost

The costs associated with this program are the inspection costs incurred by the states. Maryland pays its inspectors $12,000/year to enforce its inventory tax law. This cost is used in the following estimate:

Number of auto wreckers	22,127
Number of scrap processors	3,500
	25,627

Assume one inspector per 100 yards = 256 inspectors

Salary	$12,000/year
50% Burden	6,000/year
	$18,000/year

Total salary for 256 inspectors = $4,608,000/year

This strategy neither collects abandoned autos or prevents abandonment. Therefore, no comparison with other strategies is possible.

2. Criteria Comparison

This strategy does not address the problem of the accumulation of abandoned vehicles, only those already collected and in wreckers and processors yards. It may even contribute to the problem if wreckers could only accept potentially high profit vehicles because of a tax or inventory restriction. It compounds the used parts value and demand impediments at points 1 and 5 in Figure III-1. The strategy creates rather than removes impediments in the scrap cycle. It reduces the wreckers ability to accept hulks and penalizes scrap processors during the time of low scrap demand.

(7) Tax or Quota on Raw Material

The use of iron in steel production would be restricted through the use of a quota system or imposition of a tax. The demand for all scrap would be thus increased and natural resources would be conserved.

1. Cost

The cost to the Government of imposing a tax on iron ore could be defrayed by adjusting the amount of the tax. There would, therefore, be no cost to the Government. The imposition of a quota would require setting maximum tonnages of ore permitted at various production levels and constant monitoring by an agency of the Federal Government. Costs for this type of program are estimated to be between one and five million dollars per year and cover the cost of developing quotas and monitoring. There would be an indeterminant cost to the steel industry in developing processes that could use additional scrap charges with current equipment or in investing in additional electric furnaces.

2. Criteria Comparison

(1) Remove Existing Accumulations. This strategy is at a remote point in the scrap cycle and affects all scrap. Its ability to create a demand for scrap, sufficient to induce collection of abandoned autos,

is doubtful except on a long-term basis. Auto wreckers currently have approximately a two-year inventory of hulks at 1970 hulk utilization rates. Each year, more automotive scrap is available that is being processed and the trend is increasing. Automotive scrap utilization would have to double or triple in order to keep pace with its availability. This strategy is more likely to increase the demand for prompt industrial scrap rather than obsolete automotive scrap. It is concluded that this strategy is of doubtful utility except as a long-term strategy.

(2) Prevent Abandonment. Initially, this strategy would do nothing to prevent abandonment. On a long-term basis, however, hulks might have sufficient value to warrant their acceptance by wreckers for other than used parts. This strategy is too remote in the cycle from the problem to assess its ability to prevent abandonment.

(3) Minimize Impact on Economics. This strategy would force the steel industry to conduct a major research and development project to determine what changes in their processes would be necessary to enable them to increase the scrap charge in existing equipment. It could also force the abandonment of certain furnace equipment in favor of electric furnaces, thus causing the loss of investment in current equipment and an additional investment in new equipment. Further, the strategy affects all scrap, not only automotive.

(4) Flexibility. This strategy is not responsive to urban and rural problems.

(5) Rapid Start-up and Phase-out. This strategy is not responsive to either condition due to R&D lead time and capitol investment requirements.

(6) Remove Impediments. On a long-term basis, this strategy could remove the demand and contaminant impediments present at points 3 and 4 in Figure III-1. It could, however, compound the impediments at point 3 if higher quality scrap displaced automotive scrap.

(8) Elimination/Reduction of Depletion Allowance

This strategy would increase the price of virgin ore through the reduction/elimination of the depletion allowance, thus making the use of scrap more attractive to steel manufacturers.

1. Cost

There would be no cost to the Government in implementing this policy. An increase in the price of steel products would result, however, if steel manufacturers continued to use virgin ore.

2. Criteria Comparison

(1) Remove Existing Accumulations. As in the previous strategy, it is doubtful that accumulations would be collected except on a long-term basis.

(2) Prevent Abandonment. Again, as in the previous strategy, this strategy is too remote from the problem to be evaluated as a means of preventing abandonment.

(3) Minimize Impact on Economics. This strategy has a major economic impact on the steel industry. Under this approach, the steel industry would lose a significant tax exemption.

(4) Flexibility. Not applicable.

(5) Rapid Start-up and Phase-out. Not applicable.

(6) Remove Impediments. This strategy would increase the demand for scrap, but not necessarily the demand for automotive scrap. Additional investments in electric furnaces or in new processes with existing equipment would be necessary to remove the contaminant problem.

(9) Subsidies

Under this strategy, subsidies would be placed at one or more points in the scrap cycle.

1. Cost

- Steel Industry -- costs to induce the steel industry to change its commitment from virgin ore processes to scrap processes in steelmaking and increase the flow of automotive scrap is indeterminant.

- Scrap Processors -- transportation costs to scrap processor yards would cost an estimated \$8 to \$9 per ton to move abandoned automobiles. Transportation costs for moving all scrap to the steel industry would cost approximately \$8 per ton.

- Scrap exporters -- exporters would be subsidized in an amount equal to the difference in current scrap effort prices and a base price established by the Government. The base price and probable fluctuations in export scrap value are not known at this time.

2. Criteria Comparison

(1) Remove Existing Accumulations.

- Steel Industry -- the ability of subsidies at this remote point in the cycle to remove existing accumulations is questionable. The dollar amount is presently unknown.

- Scrap Processors -- subsidies to scrap processors to be used for the support of transportation costs could be very effective in removing existing accumulations. The subsidy would directly attack the transportation cost impediment in the scrap cycle. Other subsidies for the processing of all auto scrap would not be as effective as the transportation subsidy cited above. Other subsidies would be "diluted" in that they would be wasted on vehicles that are normally processed through the cycle.

(2) Prevent Abandonment.

- Steel Industry -- this strategy is too remote from the problem to realistically assess its value
- Scrap Processors -- subsidy at scrap processing industry would assist in the collection of existing accumulations but would not prevent abandonment
- Scrap Exporters -- the subsidy of the scrap exporters would not prevent the abandonment of automobiles.

(3) Minimize Impact on the Economics.

- Steel Industry -- the impact on the economics of the steel industry or the cost to the government as stated earlier is indeterminate
- Scrap Processors -- the cost to collect automobiles or to bring them to scrap processing yards can range from $5 to **$50** or more. The annual cost to transport or subsidize the transportation of vehicles to scrap processing industry for one-half million vehicles could therefore range from several million to 25 million dollars. This excludes the backlog
- Scrap Exporters -- again, the economic impact of such a strategy is not determinate.

(4) Flexibility.

- Steel Industry -- this strategy does not account for urban and rural problems in abandonment
- Scrap Processors -- subsidizing the cost of removing abandoned automobiles to scrap processing yards from rural areas where transportation costs are high would be responsive to the rural problem
- Scrap Exporters -- this strategy is not responsive to urban and rural problems.

(5) Rapid Start-up and Phase-out. The flexibility of subsidies in combating the abandoned automobile problem is really not an issue. Initiation would require legislative action and would be quite slow. Once initiated, a long-term evaluation program would be required to assess the value of the subsidy. If found ineffective, the legislative process would have to be reversed. Subsidies generally represent a long-term commitment.

(6) Remove Impediment.

- Steel Industry -- the demand for scrap would be increased but it is not known how the increased demand might affect automotive scrap
- Scrap Processors -- with the subsidy of the transportation of automotive scrap, a demand could be expected. However, the amount of this demand is currently unknown
- Scrap Exporters -- this strategy would increase the flow of all scrap, with a proportional impact on automotive scrap.

(10) Differential/Restricted Purchasing

Under this plan the government would favor in its purchasing, those steel items with a higher total scrap content.

1. Cost

The cost to the government for this policy is indeterminate.

2. Criteria Comparison

This strategy is too remote from the problem to assess its effects. Its value in preventing abandonments is questionable. It would be a continuing program requiring extensive research in the amount of the price differential or the restrictions required in the purchase of items made from virgin ore.

(11) Improved Equipment

Assistance could be rendered by the government in acquiring improved scrap processing equipment at various points in the scrap cycle. Improved equipment could be acquired through loans, new technology, or accelerated depreciation schedules. The cost of the program would depend upon the specifics of the program. However, lack of equipment or specific equipment types is not related to vehicle abandonment. In some instances, new equipment could be used to accelerate the flow of scrap from wrecker to processor or from processor to steel mill, but would likely have no impact on the problem which is the subject of this study. Its primary effect, would likely be to subsidize transportation costs by reducing the investment required by some entities in the cycle.

(12) Copper Tax

This strategy would impose a tax on the use of copper by automobile manufacturers in the manufacture of automobiles. The purpose of the strategy is to reduce the copper content in automotive scrap when it is finally processed through the scrap-processing industry and the steel industry, thus removing one of the major contaminants and therefore impediments to the flow of automotive scrap through the automotive scrap cycle.

1. Cost

The costs of the strategy would be those costs associated with the research and development funds necessary to support the development and evaluation of new materials to replace copper in automobiles. This strategy would have a significant impact on the automotive industry and the secondary metals industry supplying copper. The dollar penalty to both these industries is unknown at this time.

2. Criteria Comparison

This strategy would aid in producing cleaner automotive scrap than that produced by balers, but approximately equivalent to the clean scrap produced by shredded scrap after separation. It is not reasonable to assume that the problems and costs of eliminating copper from automobiles could be justified by any indirect benefits related to the quality of automotive scrap.

(13) Regulate Auto Composition

Through the imposition of automobile standards, the use of certain materials that would contaminate scrap would be restricted. The same logic applied to the copper tax above applies.

(14) Stockpiling

Under this program the Federal government or state governments would assume the responsibility for collecting and storing abandoned automobiles.

1. Cost

Costs of this program are assumed to be similar to strategy No. 3 - Establish Free Disposal Sites.

2. Criteria Comparison

(1) Existing Accumulation. Under this plan, the government would remove existing accumulations and future accumulations through state or federally operated stockpiling areas.

(2) Prevent Abandonment. This strategy is not geared to prevent abandonment, but rather to provide a storage place for abandoned cars.

(3) Minimize Impact on Economics. As stated above, the economic effects are comparable to those discussed for strategy No. 3.

(4) Flexibility. The strategy could be made flexible for both urban and rural problems by the number and identity of such stockpile sites.

(5) Rapid Start-up and Phase-out. Neither start-up time nor phase-out time would be short. Significant land-acquisition and preparation time would be required. Land disposal could be likely.

(6) Remove Impediments. This strategy removes no technological impediments to the auto-scrap cycle.

(15) Education

This is considered to be a passive strategy in the abandoned automobile problem. It is suitable as a supplement to any strategy that deals directly with auto problems.

(16) Bounty on all Automobiles

Under this approach, auto wreckers and scrap processors would be paid a bounty set by the state for processing all automobiles. This strategy is currently in effect in the State of Maryland.

1. Cost

Assuming the auto wrecker and scrap processor received $5.00 payment from the state for processing automobiles on a nation-wide basis, this program would cost nearly $80 million, assuming a nine million per year retirement rate. This rate would increase even at a constant percentage of vehicles taken out of service due to increased registration or purchasing of new vehicles.

2. Criteria Comparison

(1) Remove Existing Accumulations. This strategy would be attractive to wreckers if the vehicles they collected were near the wrecking yards and had parts values that could offset the cost of transportation. Once transportation costs exceeded the $5.00 value, there would be no incentive for wreckers to remove these vehicles, since most of the vehicles have no parts value. Scrap processors, on the other hand, would find this program attractive, since they are not in the parts business, but in the scrap-processing business. They would, however, be reluctant to accept these vehicles during the time of low scrap demand, as evidenced in the State of Maryland.

(2) Prevent Abandonment. Auto wreckers may be able to prevent the abandonment of some vehicles through their ability to pay a slightly higher price for older cars. The strategy is considered marginally acceptable in the prevention of abandonment.

(3) Minimize Impact on Economics. As stated earlier, this program would cost approximately $80 million. To prevent the abandonment of half a million vehicles, this program would cost approximately $160 per abandoned vehicle.

(4) Flexibility. This strategy does not address urban and rural abandonment problems and therefore it is considered unresponsive.

(5) Rapid Start-up and Phase-out. This would be a continuing program requiring the development of an administrative office and administrative procedures and is not considered responsive to this criteria.

(6) Remove Impediments. This strategy has a minimal impact on the economics impediment shown at point 1 on the scrap cycle (Figure III-1).

(17) Transfer Salvage Rights to Wreckers

1. Cost

The collection costs for 65,000 vehicles were derived from data furnished by the City of New York, Department of Sanitation. Administrative costs were estimated based upon information furnished by the city.

(+) indicates money paid to the city by wreckers

(-) indicates money paid to the wreckers by the city

Collection Costs/Car		Number of Vehicles	Total Collection Cost
Brooklyn	(+) 1.03	10,000	(+)10,300
	(+) 1.32	15,000	(+)19,800
Queens	(+) 4.06	10,000	(+)40,600
Richmond	(+) 5.25	1,500	(+) 7,875
Manhattan	(-) 9.75	5,000	(-)48,750
	(-)10.00	7,000	(-)70,000
Bronx	(+) 0.25	9,000	(+) 2,250
	(+) 4.03	8,000	(+)32,240

Money paid to the city	$113,065
Money paid to wreckers	$118,750
Cost to the city for collection	$ 5,685
Cost per vehicle (collection)	$ 0.09 (rounded)

There are eight inspectors, one for each contract. Assuming a salary of $10,000/year each, with a burden rate of 50 percent:

8 salaries	$80,000
50% burden rate	40,000
Collection cost	5,685
Total	$125,685

Cost per vehicle: $\frac{\$125,685}{65,000}$ = $1.90/vehicle

Prior to the implementation of this approach, cost estimates were made by city officials to determine if it would be more economical to collect the vehicles with city owned equipment. Analyses revealed that the cost would be $65.00 per vehicle.

2. Criteria Comparison

(1) Remove Existing Accumulations. This strategy is directly involved in the removal of abandoned autos and is considered responsive to this criteria. Contractors are obligated to collect vehicles under the terms of their contract.

(2) Prevent Abandonment. This strategy does not prevent abandonment.

(3) Minimize Impact on Economics. At a cost of $1.90/vehicle, this strategy has a minimal impact on costs to the taxpayer.

(4) Flexibility. This approach is geared specifically for urban areas where vehicle density is high and salvage value is relatively high if collection is prompt. It is not particularly useful in rural areas where title transfer is not the critical problem.

(5) Rapid Start-up and Phase-out. The establishment of a program with appropriate inspection and control procedures could require about six months lead time. Phase-out time would be the time required to cancel wreckers' contracts with municipalities.

(6) Remove Impediments. The strategy removes the transportation impediment shown at point 5 in the cycle (see Figure III-1).

(18) Subsidize Transportation Costs from Abandonment Site to Disposal Site

Provide subsidies in terms of transportation costs to independent collectors and transfer to the collector salvage rights to the stripped hulks.

1. Cost

The following costs were provided by the State of Vermont and were incurred during the summer of 1969.

Total number of cars removed	13,151
Total expenditure	$130,169.73
Cost per car	$9.90 (rounded)

The cost per car is divided as follows:

Payment to collector	$8.56
Payment per ton to municipality	0.65
Administrative costs	0.69
	$9.90

The state also reported that when scrap prices were high, collectors were willing to pay $1.00 for each vehicle. The cost of the program would have been only $0.34 per vehicle if all hulks were bought from the state.

2. Criteria Comparison

(1) Remove Existing Accumulations. This strategy is designed to collect accumulations and is being successfully used in the State of Vermont.

(2) Prevent Abandonment. This strategy does not address this problem and is therefore unresponsive.

(3) Minimize Impact on Economics. This strategy would cost approximately $30 million to remove the existing accumulation of abandoned cars without disrupting the economics of any entity in the cycle.

(4) Flexibility. This strategy is designed for rural areas.

(5) Rapid Start-up and Phase-out. Based upon Vermont experience, the lead time for this program would be approximately four to six months and could be phased out through cancellation of independent collector contracts.

(6) Remove Impediments. This strategy removes the transportation impediment at point 5 in the cycle (see Figure III-1).

5. SUMMARY

A comparison of the costs of selected strategies is shown in Table V-2. The transferral of salvage rights to both wreckers and independent collectors in urban areas, and a transportation subsidy in rural areas is the least expensive means of removing abandoned automobiles. These strategies alone do not mitigate the problem because they allow abandonment while efficiently collecting cars. An additional strategy therefore, to prevent the aesthetic deterioration of the environment by abandoned autos, is needed. A disposal certification program is recommended as the least costly to taxpayers.

The overall recommended strategy is:

- To Collect Existing Accumulations -- Provide a subsidy to independent collectors in rural areas through state sponsored contracts. Municipalities/counties would, through state assistance, select a central collection point for the scattered accumulations. The independent collector would prepare the vehicles for transportation to scrap processing yards. In urban areas, the cities would contract with auto wreckers to remove all illegally parked autos. Those autos unclaimed would revert to the wreckers' ownership after a specified period of time

Table V-2
Summary of the Costs of Primary Alternate Strategies

Purpose	Strategy	Estimated Effectiveness	Estimated Cost per Vehicle*
Prevent Abandonment	Disposal Deposit	High	$100-$400
	Disposal Certification	High	$6.00-$12.00
Facilitate Collection	Transfer Salvage Rights and Contract for Removal	High in High Density Areas	$ 2.00-$5.00
	Transportation Subsidies	Medium in Rural Areas (but best available)	~$ 10.00
	Ease Title and Transfer Requirements	Just an Aid	Minimal

*Based on an assumed 500,000 vehicles abandoned per year.

to be dismantled or otherwise disposed. To assist in this procedure it is recommended that a threshold of $100 value and an age of seven model years or older be adopted as a guideline for no owner notification of disposal. Further, the vehicle must not be in working order as a means for transportation and does not carry a current registration. To assist in the process of removing vehicles from private property, those owners unwilling to permit the removal of existing accumulations would be required to register all vehicles or render them visually undetectable from public rights of way or adjacent property. Failure to comply with the above would result in removal by public authorities.

- To Prevent Abandonment -- The disposal certification strategy is summarized in Figure V-2 and its imposition, is necessary to preserve the environment and encourage the responsible disposal of vehicles by all citizens. The costs of allowing abandonment are completely subjective. Obviously, those citizens with accumulations of autos on their property do not consider them a sufficient blight on the environment. They do not degrade the environment by a dollar value equal to removal costs. Other citizens may consider them to be worth the Federal, state and municipal investment in parks or other land beautification projects. During this study, it was assumed that abandoned autos were indeed an aesthetic and resource waste problem and that any strategy that would remove them would accrue in the public good. The aim of this study was to remove abandoned autos directly and prevent their future abandonment at the lowest possible cost to the taxpayers and with minimum disruption to citizens, industry, and government.

VI. DISCUSSION OF A DYNAMIC MODEL OF THE AUTOMOBILE OUT-OF-SERVICE CYCLE

In this chapter the dynamic aspects of the basic automobile scrap cycle are discussed. The results of a dynamic model of the cycle indicate that:

- Automobile abandonment was not a major problem prior to the mid-1950's
- The rate of accumulation of abandoned automobiles increased dramatically in about 1960
- Based on a worst case estimate with a 1946 datum, the model predicts that there are definitely less than 19.5 million unprocessed automobile hulks in the United States
- The model results correlate well with calculated auto scrap processing rates—without employing scrap price as a parameter.

The discussion of the dynamic model is divided into four parts; scrap cycle characteristics, the model, use of the model, and modeling the entire scrap cycle.

1. BASIC AUTOMOBILE SCRAP CYCLE CHARACTERISTICS

In Figure VI-1 a very simple description of the cycle by which a deregistered auto is converted to scrap is given. Inefficiency in this process results in the accumulation of unprocessed autos. For convenience in the figure, the basic cycle has been divided into three basic steps:

- Collection and salvage
- Processing
- Reuse.

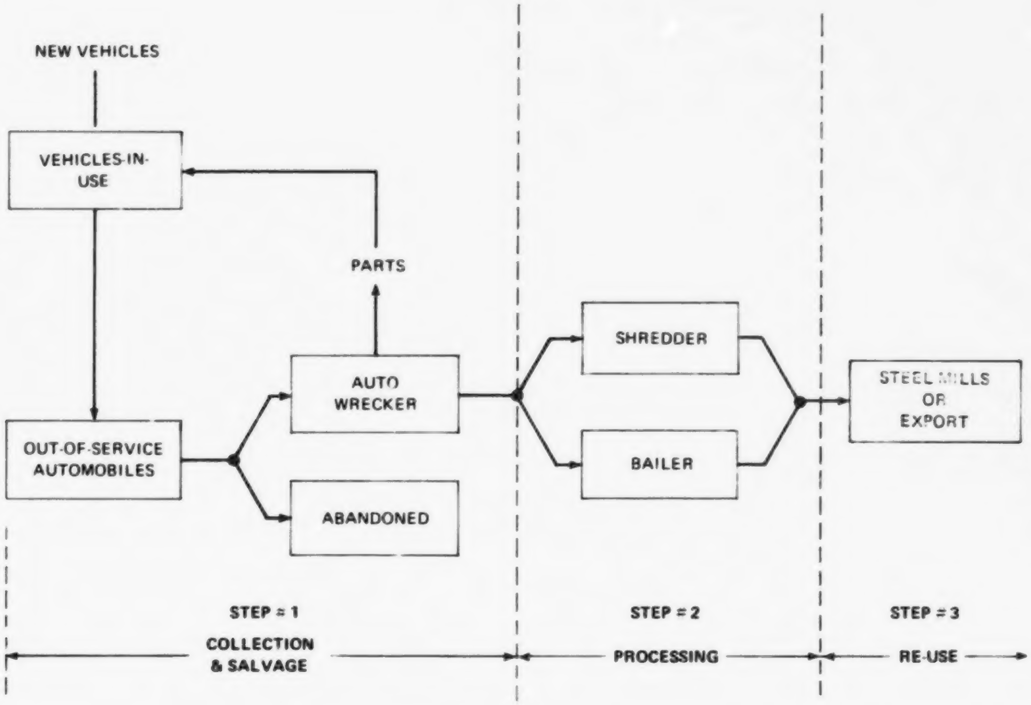

NEW VEHICLES
VEHICLES-IN-USE
PARTS
AUTO WRECKER
OUT-OF-SERVICE AUTOMOBILES
ABANDONED
SHREDDER
BAILER
STEEL MILLS OR EXPORT
STEP = 1
COLLECTION & SALVAGE
STEP = 2
PROCESSING
STEP = 3
RE-USE

FIGURE VI-1
Basic Automotive Scrap Cycle

These divisions, although somewhat arbitrary, serve to illustrate basic aspects of the auto scrap cycle. First, the abandoned auto problem is essentially an inefficiency in the collection process. Once collected, autos are processed into scrap and ultimately reused in a somewhat efficient fashion. This is clearly the case, since if it were otherwise, a substantial rapidly increasing build-up of auto hulks at auto wreckers and scrap piles at processor's yards would be evident, given the very large number of autos deregistered each year.

Although 100 million autos were deregistered between 1946 and 1970, it is unlikely that the inventory of auto wreckers and scrap processors at this time exceeds more than 9 million autos. Indeed, the scrap processing capacity available in the U. S. greatly exceeds that required to process all autos deregistered each year. Thus, the key step in the auto scrap cycle is that related to collection and salvage, for it is here that the abandoned auto problem starts.

Figure VI-1 illustrates the fashion in which the auto scrap cycle is typically described. This description is inadequate! The cycle is a dynamic process in which a series of feedback loops control the flow of autos, auto hulks, and scrap from autos. Figure VI-2 displays these feedback loops. An adequate understanding of the cycle is only obtained when the factors involved in this feedback process are fully understood and quantified. As mentioned earlier, basic statistics indicate that the feedback characteristics in the processing and reuse steps are such as to generally facilitate rapid efficient flow of material resources to re-use. This suggests that an understanding of the feedback or dynamic characteristics of the collection and salvage portion of the cycle may hold the key to the abandoned auto problem.

It is widely accepted and evident by the results of surveys conducted in this study, that auto wreckers primarily operate to sell used auto parts salvaged from out-of-service autos. The eventual transfer of auto hulks to scrap processors is more the result of inventory limitations (usually self-imposed) than of potential economic benefits derived from the transaction. Thus, from the auto wrecker's viewpoint, the primary cycle is the used auto parts cycle, with the resultant auto hulk essentially a necessary operating evil.

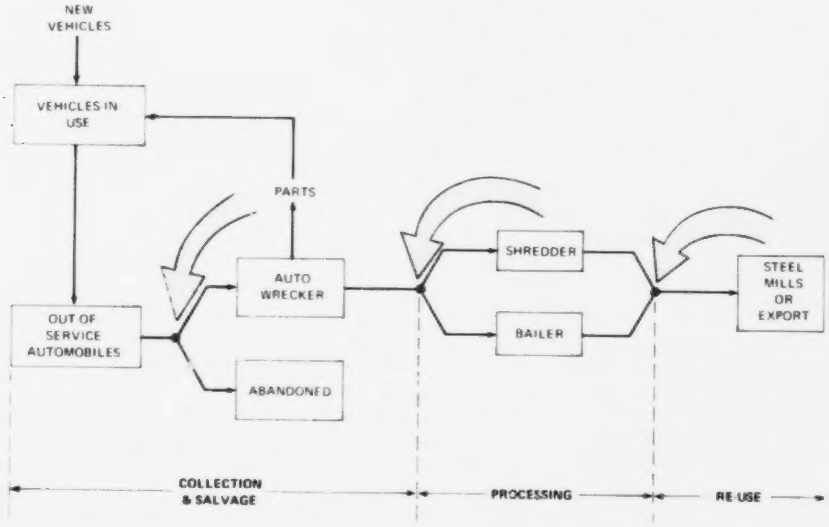

NEW VEHICLES
VEHICLES IN USE
PARTS
AUTO WRECKER
OUT OF SERVICE AUTOMOBILES
ABANDONED
SHREDDER
BAILER
STEEL MILLS OR EXPORT
COLLECTION & SALVAGE
PROCESSING
RE-USE

FIGURE VI-2
Basic Cycle Showing Dynamic Feedback

The auto wrecker will be strongly affected by the demand for used auto parts. When demand is high he will retain his inventory of auto hulks/parts and perhaps seek to obtain as many out-of-service autos as possible. When the wrecker realizes that demand has dropped below the level consistent with his inventory, he will begin liquidating the inventory of auto hulks by transferring them to the scrap processor. Note the demand perceived by the auto wrecker for parts is not the same as actual demand. A time lag required for the wrecker to realize that the parts business is "turning bad" and to compensate will always be present in the cycle. A similar time lag exists for the wrecker to realize increasing parts demand (see Figure VI-3).

The number of autos that eventually are processed into scrap is not solely a function of the characteristics of the auto wrecker, but also of the owner. Each year a certain percentage of autos never make it into the scrap cycle. The vehicles are abandoned and existing collection processes are not sufficiently efficient to remove them to a wrecker, scrap processor, or even an impounding lot. It is likely that the number of autos abandoned is directly related to the number of autos that go out of service, all other factors being equal.

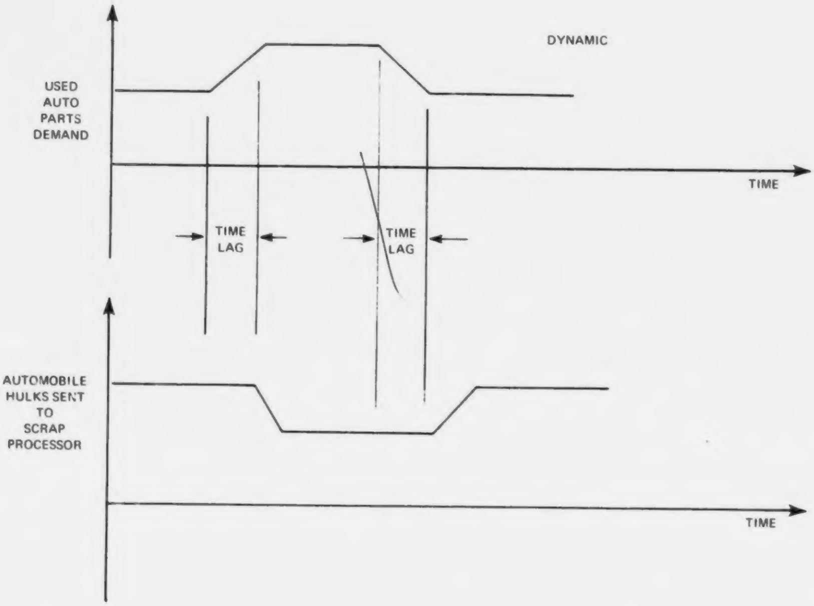


FIGURE VI-3
Auto Wrecker Characteristics

Since it normally takes an auto wrecker 12 to 18 months to pass hulks on to the scrap processor, the extent of auto abandonment in a given year does not become evident in terms of scrap processing rates until a year or more later.

2. A SIMPLE DYNAMIC MODEL

Based on the discussion presented in the previous section, a simple dynamic model of the collection portion of the auto scrap cycle has been constructed. Such a model is shown in Figure VI-4. Note that the model construction indicates a certain lack of data. No feedback loops are shown influencing the owner decision. Although this is not the case in reality, no reliable data is available on the factors that motivate auto abandonment. Thus, in the model, it is assumed that a fixed percentage of autos are abandoned and never collected. The remainder of the out-of-service autos reach the auto wrecker, either directly or through the collection of autos which were initially abandoned.

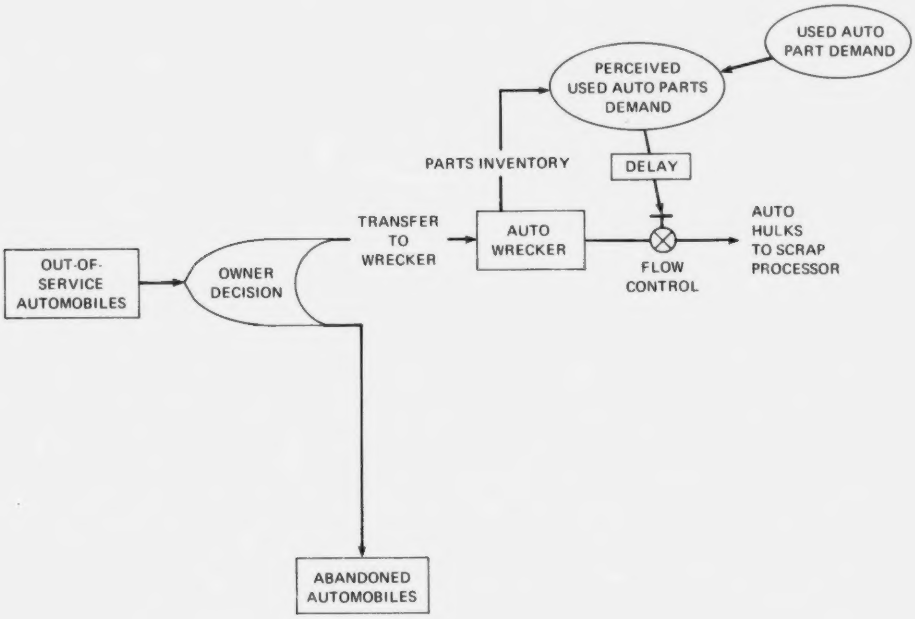

USED AUTO PART DEMAND
PERCEIVED USED AUTO PARTS DEMAND
PARTS INVENTORY
DELAY
TRANSFER TO WRECKER
AUTO WRECKER
AUTO HULKS TO SCRAP PROCESSOR
OUT-OF-SERVICE AUTOMOBILES
OWNER DECISION
FLOW CONTROL
ABANDONED AUTOMOBILES

FIGURE VI-4
Simple Dynamic Model of the Collection Step in the Auto Scrap Cycle

The only feedback shown in the dynamic model of Figure VI-4 is that involving the operation of the auto wrecker. Note that the auto wrecker compares his inventory to the used automobile parts demand and based on the resultant perceived demand, regulates the flow of auto hulks to the scrap processor. He may even seek out-of-service autos if the demand is high. Note that some delay is shown in the feedback loop which regulates the flow of auto hulks to be processed, since the wreckers' perception time is not instantaneous.

Although the model shown in Figure VI-4 could be computerized and expanded as data became available, the basic validity of the assumptions that led to the model can easily be tested by attempting to correlate historical data. For very crude correlation purposes, the model is represented by the following approximation:

$$\begin{array}{l}\text{Vehicles Processed}\\ \text{to Scrap}\end{array} = f\left(\begin{array}{l}\text{Number of Out-of-Service}\\ \text{Vehicles, Used Auto Parts}\\ \text{Demand, and Time Delay}\end{array}\right) \quad (1)$$

This functional relationship is a simplification of the model, in that the complex relationships that may make up perceived parts demand are approximated. The functional relationship must be further simplified into a mathematical expression to be useful as a data correlation tool. Such a simplification given as follows:

$$V.S._t = K_1 (V.O.\,OS)_{t-1} + K_2 (P.D.)_{t-1} \quad (2)$$

where

$V.S._t$ = Number of vehicles processed to scrap in year, t

$V.O.\,OS_{t-1}$ = Number of vehicles out-of-service in the year of, t-1

$P.D._{t-1}$ = The demand for used auto parts in the year, t-1

K_1 = A proportionality constant representing the typical percentage of vehicles that reach the auto wrecker

K_2 = A proportionality constant representing the extent of influence that parts demand has on the auto wrecker's decision to transport hulks to the scrap processor.

Note that a basic time delay of one year is assumed for convenience. The expression given above (2) is an extremely unsophisticated representation of the dynamic model of Figure VI-4, yet it exhibits remarkable effectiveness in correlating the percentage of out-of-service vehicles processed to scrap. In order to establish sufficient information for testing the correlation of data by Equation (2), a value for the parts demand factor (PD) must be estimated, since no direct data is available on used parts sales by auto wreckers, nor is this data likely to become available in the near future. Thus, the following relationship was assumed:

$$\text{Parts Demand} = \frac{\text{Auto Registered (AR)}}{\text{New Auto Sales (NC)}} - K \qquad (3)$$

where K is a reference nominal value.

A plot of this demand curve is shown in Figure VI-5 (normalized and shifted to axis). Thus based on Equations (2) and (3), only three bits of input data are required to predict the number of vehicles processed into scrap in any given year:

- The number of vehicles deregistered during the previous year $(V.O.OS)_{t-1}$
- The number of new vehicles sold the previous year $(NC)_{t-1}$
- The number of vehicles in the registered vehicle population the previous year $(AR)_{t-1}$.

3. USE OF DYNAMIC MODEL TO QUANTIFY THE NUMBER OF ABANDONED AUTOMOBILES

In the previous section a dynamic model of the collection portion of the auto scrap cycle was developed. The model was greatly simplified to the following mathematical expression:

$$VS_t = K_1 (V.O.OS)_{t-1} + K_2 \left[\frac{AR}{NC}\right] - K_{t-1} \qquad (4)$$

Quantification data from the years 1958 - 1970 presented earlier was used to determine the values of K_1 and K_2. In Figure VI-6, a

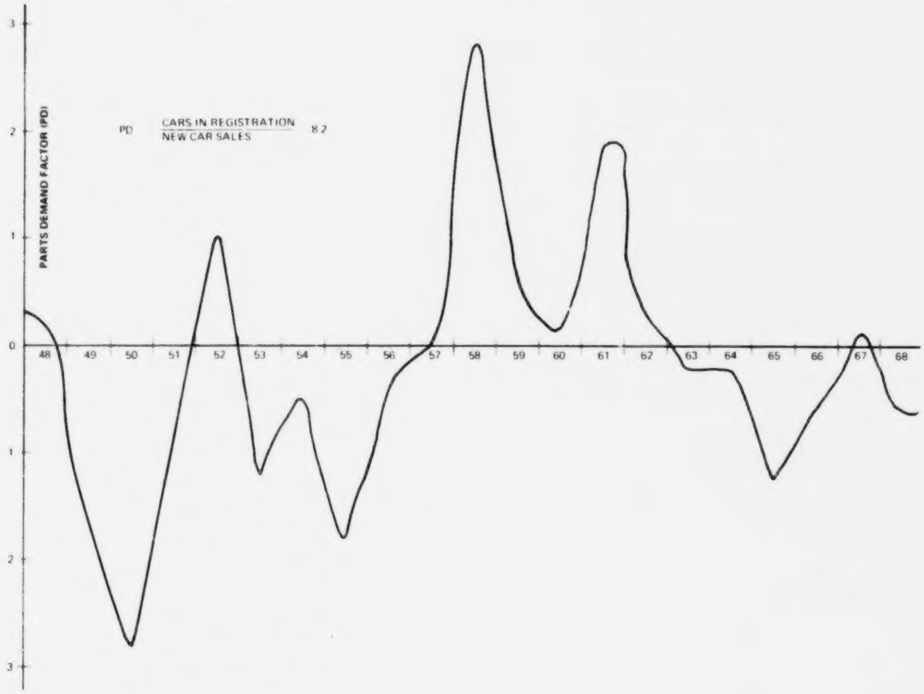


FIGURE VI-5
Parts Demand Factor (PD)

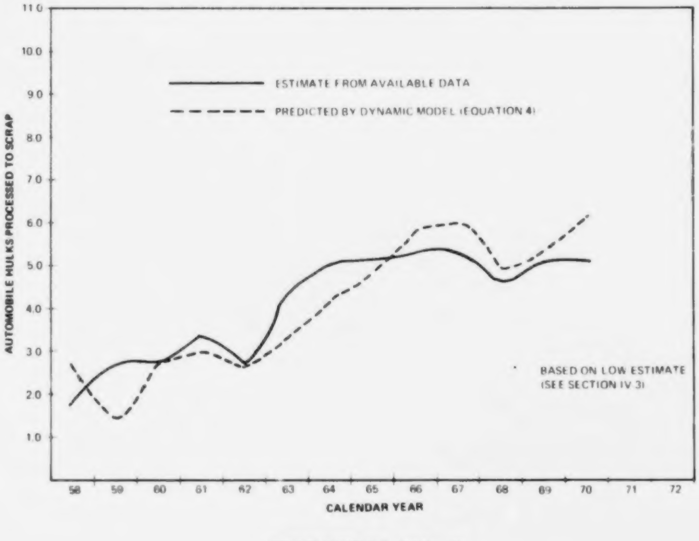


FIGURE VI-6
Actual vs Predicted Scrappage Rates

comparison of the prediction of the dynamic model and scrappage estimates obtained from published data is presented. Note that the simplifying assumption of a fixed one-year time lag causes some time shift discrepancies in the data, but the behavior of the two curves is quite similar. Perhaps the most important result is that the area under the curves, which represents the total number of autos processed into scrap between 1958 and 1970 agrees within 1 percent. Thus, the dynamic model simplified to the form of Equation (4), matches the behavior of the auto scrap cycle based on available data. Prior to 1958, data does not exist in sufficient detail to calculate the number of vehicles converted to scrap in a direct fashion. The dynamic model, however, can be employed to predict scrappage rates back to the post World War II period. This extrapolation of data is important, since it is reasonably judicious to assume that very little auto scrap was available in 1946. Thus, an excellent datum for abandoned autos is established.

The results of the dynamic model provide useful data with regard to the history of abandoned auto hulk accumulation since 1946. As shown in Figure VI-7 the dynamic model prediction for the worst case indicates that a maximum of 24. 75 million auto hulks have accumulated in the United States since the end of the second World War. Thus, the result brackets those presented in Chapter IV, Figure IV-2, which were based upon direct estimates from available data. Figure IV-2 indicates that between 8 and 20 million auto hulks have not been processed. The slightly higher number given by the dynamic model indicates a buildup of auto hulks in the 1945-1958 period for which no direct data is available. Dynamic model results for a worst case condition indicate that the rate of accumulation increased substantially in about 1959. (See Figure VI-7.) Thus, available data covers the period of time (1958 to 1970) during which the problem has become acute. The maximum possible number of abandoned auto is calculated to be 19. 5 million.

In summary, the dynamic model yields results consistent with direct estimates. Slightly higher estimates of total accumulation result from extrapolations back to the 1945 datum.

4. DYNAMIC MODELING OF THE ENTIRE SCRAP CYCLE

A simple dynamic model of the auto collection sub-loop of the auto scrap cycle provides valuable insight into process characteristics.

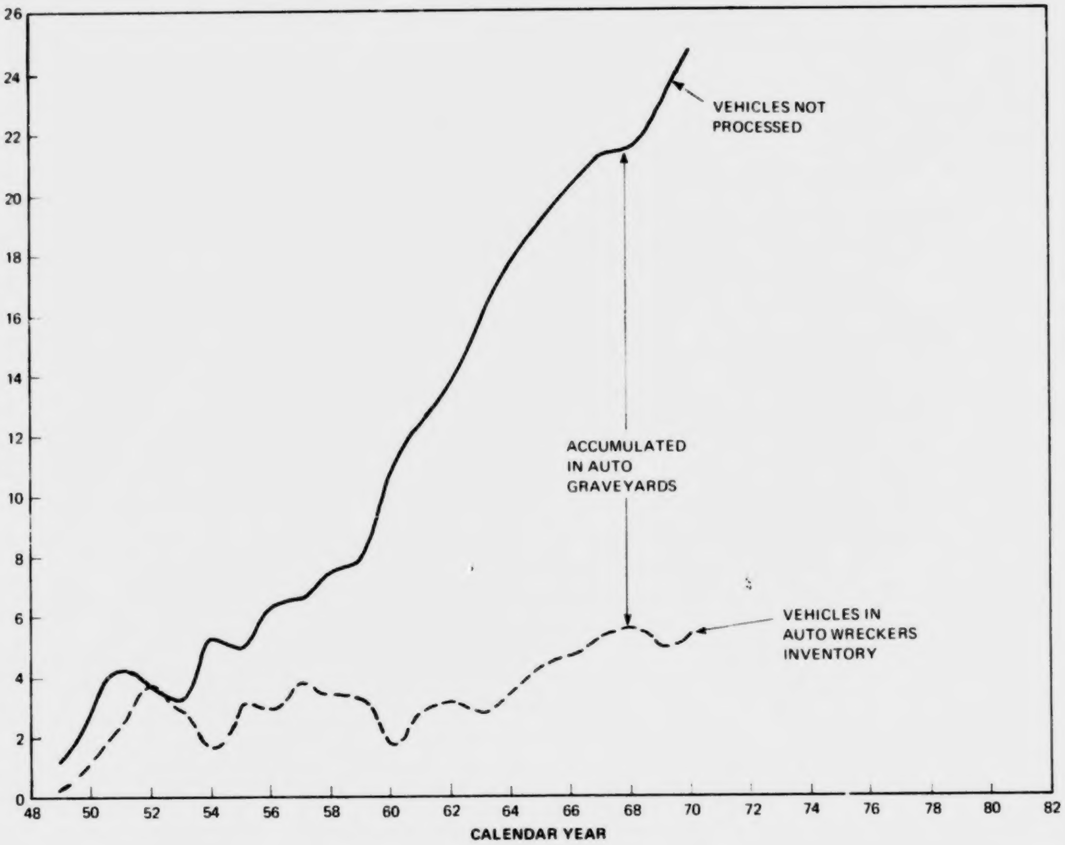


FIGURE VI-7
Auto Hulk Accumulation - 1948 to 1971

Since this effort is primarily addressed to the abandoned auto problem, the model was not expanded beyond factors which acted directly on that specific problem. The complex nature of the TOTAL scrap cycle with its many dynamic feedback characteristics strongly indicates that strategies which might be proposed in the recycling area such as:

- Changes in depletion allowances
- Changes in transportation rates to steel mills
- Changes in steel making processes

cannot be adequately assessed without examining the dynamic characteristics of the scrap cycle.

Much of the data required for such an endeavor is available. Some of it has been collected during this study, and much of the remainder is available in the form of Federal Government and industry association statistics. The utility of such a model in setting national policies associated with scrap recycle is substantial. When dealing with such complex systems, great care must be exercised when changing economic and legal constraints and incentives. Often counterintuitive results of catastrophic proportions can result from policies aimed at solving one problem. This is the result of often subtle feedback effects, which radically distort the economic picture in other areas of the overall cycle.

Fortunately the abandoned auto problem can be solved without resorting to sweeping strategies affecting the entire scrap cycle. In the long run, however, without an in-depth understanding of the entire cycle, these strategies may be sub-optimal.

As the Environmental Protection Agency moves into an era in which the recycling of natural resources becomes increasingly important, a basic dynamic model of the entire scrap cycle will be indispensable for the selection of the proper course of action in numerous regulatory questions. This model will not be easy to construct, but the tools required are at hand and the job can be started now. Major complex questions that will arise cannot be effectively answered on a piecemeal basis.

VII. GUIDELINES FOR ORDINANCES TO AID IN MITIGATING THE ABANDONED AUTOMOBILE PROBLEM*

The problem of abandoned automobiles has been separated in this report into a problem of abandonment per se and a problem of collection of abandoned vehicles. Recommendations were made to cope with both of these problems, and some of these recommendations require enabling legislation at the state or local level for implementation. This chapter suggests the key elements of several pieces of legislation which are recommended. The discussion is presented in terms of the two separate problems.

1. GUIDELINES FOR ORDINANCES TO PREVENT ABANDONMENT

In 1970, the Automotive Sub-Council of the National Industrial Pollution Control Council, in a report to the Secretary of Commerce entitled "Junk Car Disposal," recommended the adoption of firm penalties against abandonment. Many states and cities provide for substantial fines for abandonment, but enforcement is nil because of the burden it places upon the police and the courts. An alternate strategy proposed in Chapter V is to require every vehicle owner to provide proof of acceptable vehicle disposal before he can license another vehicle in that state. The mechanism by which this scheme would work within each state department of motor vehicles, is shown in Figure V-2. That figure provides basic guidance for the development of state legislation which should as a minimum include the following requirements:

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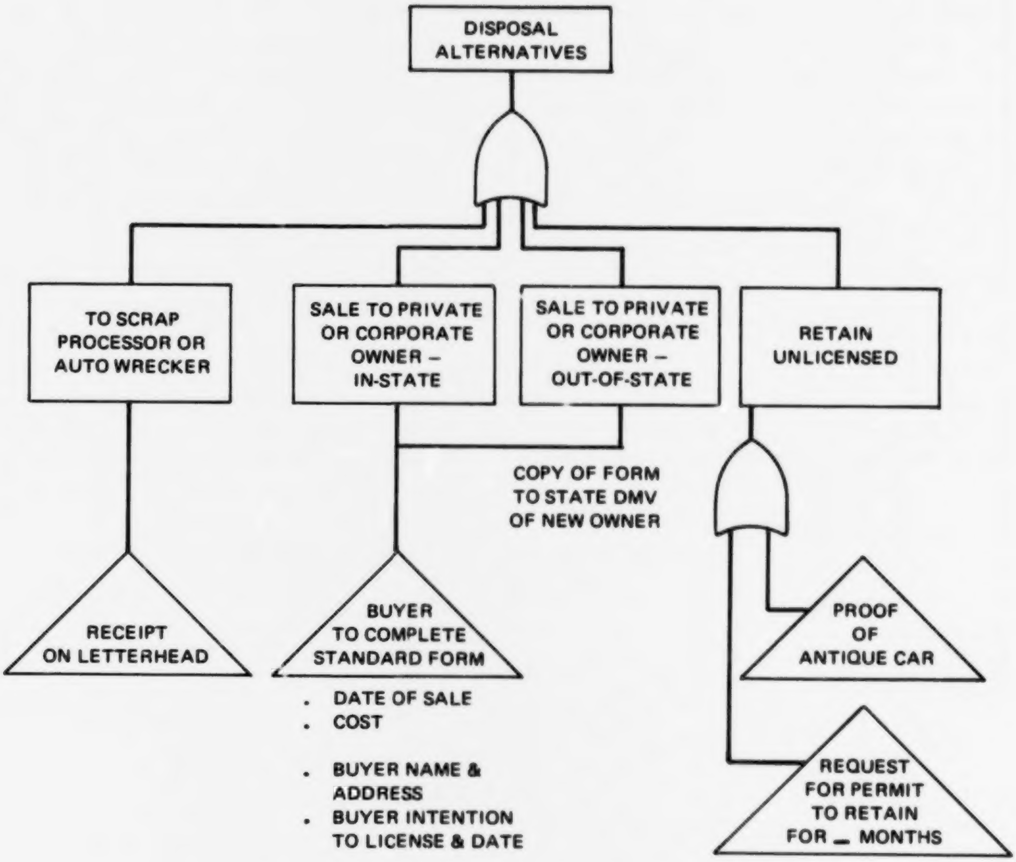
* Booz, Allen does not perform legal research nor provide advice on legal matters. The material included in this chapter represents guidelines only for these elements which are recommended for inclusion in ordinances related to the abandoned auto problem. The proposals should be reviewed by independent legal counsel for their legal implications.

- No registration applicant who has previously licensed a car in the subject state, shall be issued a registration unless he can provide proof that:
  - he has disposed of the vehicle in some acceptable form
  - he continues to license the previous vehicle
- Proof of disposal shall consist of any of the following (see Figure VII-1):
  - receipt from a scrap processor or auto wrecker (on his letterhead)
  - certification from a private or corporate buyer stating the pertinent information regarding the purchase, and the buyer's intention to register the vehicle
  - owner certification that the vehicle is an "antique car" within the definition specified by the DMV
  - an approved request (by the DMV) to retain the vehicle on private property for a specified time and purpose (e. g., for parts removal or future restoration).

Several problems can be anticipated in implementing the disposal certification requirement. These are discussed below:

- Variance in Applicant's Name--The file of restricted registrants must be searched on a last name basis, with correlation provided through initials plus either address, social security number, or driver's license number
- Precedent for Fines--A state law must exist or be passed prohibiting motor vehicle abandonment and requiring proof of disposal in order to provide a basis for levying a fine on would-be registrants who appear on the list of restricted registrants and who cannot submit proof of disposition of a prior vehicle.

FIGURE VII-1
Acceptable Disposal Alternatives
and Proof Requirements


DISPOSAL ALTERNATIVES
TO SCRAP PROCESSOR OR AUTO WRECKER
SALE TO PRIVATE OR CORPORATE OWNER – IN-STATE
SALE TO PRIVATE OR CORPORATE OWNER – OUT-OF-STATE
RETAIN UNLICENSED
COPY OF FORM TO STATE DMV OF NEW OWNER
RECEIPT ON LETTERHEAD
BUYER TO COMPLETE STANDARD FORM
. DATE OF SALE
. COST
. BUYER NAME & ADDRESS
. BUYER INTENTION TO LICENSE & DATE
PROOF OF ANTIQUE CAR
REQUEST FOR PERMIT TO RETAIN FOR _ MONTHS

The details of the above ordinance would have to be worked out by individual states to assure compatibility with existing laws and the state motor vehicle licensing and registration system. To accomplish this a pilot program in one state has been recommended.

A suggested outline for a disposal certification ordinance is given in Figure VII-2.

2. GUIDELINES FOR ORDINANCES TO FACILITATE COLLECTION

The barriers to efficient collection of abandoned vehicles include the following:

- Lack of legal evidence of ownership
- Requirements for owner and lien holder notification
- Cost of vehicle collection
- Cost of vehicle transportation to scrap processor.

Procedures have been recommended to reduce these barriers. Guidelines to implement the recommendations are summarized below.

(1) Uniform Titling Law

To facilitate the acceptance of out-of-service and abandoned automobiles by scrap processors, auto wreckers and collectors, it is recommended that all states adopt a uniform motor vehicle titling law. Models of such a law are available (e. g., Uniform Vehicle Code and Model Traffic Ordinance, Revised - 1968, by the National Committee on Uniform Traffic Laws and Ordinances, 525 School Street, S. W., Washington, D. C.).

(2) Procedures to Facilitate the Handling of Abandoned Vehicles

States should adopt facilitating legislation to spell out the mechanics of handling abandoned and other junk vehicles. It is suggested that such legislation be based on Suggested State Legislation on Abandoned Motor Vehicles, published by the

FIGURE VII-2
Proposed Outline for a Disposal
Certification Ordinance

1. Title - The Vehicle Disposal Certification Ordinance of the State of (name of state)

2. Declaration of Policy - The purpose of the ordinance is to institute a requirement that proof of vehicle sale or disposal be provided to the State Department of Motor Vehicles, in order to motivate owners to responsibly dispose of unwanted vehicles.

3. Administration and Enforcement - The Department of Motor Vehicles shall be the agency responsible for administering and enforcing the ordinance.

4. Disposal Certification Requirements - Will vary depending upon whether state has title law or not. For title states, proof of disposal can be shown by an official duplicate of the title signed over to the new owner. In a non-title state, a notarized bill of sale from the seller would substitute.

5. Procedures for Handling Vehicle Registration Requests - Procedures generally following the logic shown in Figure V-2 are recommended for handling vehicle registration applications and the file of restricted registrants. These procedures will have to be adapted to the motor vehicle registration data processing systems of each state.

6. Special Permits for Unregistered Vehicles - Provisions must be made to permit owners to retain unregistered vehicles under special circumstances including antique vehicles, and vehicles retained for short periods for repair. Special permits issued by the DMV are suggested.

7. Fees - Where a disposal certificate cannot be furnished a fee of $100 - 200 is recommended to permit registration of a new vehicle. Any moneys so collected would go into a fund to subsidize municipal abandoned vehicle collection programs.

Council of State Governments, 1313 East 16th Street, Chicago, Illinois,[1] as amended by several provisions described below.

The Council's Suggested State Legislation covers the following procedures:

- Defines police department, abandoned motor vehicle, and demolisher,
- Gives clear authority to the police department to take possession of abandoned vehicles,
- Requires notifications to owner and lienholder of each abandoned vehicle taken into custody,
- Requires that each unreclaimed vehicle shall be sold at public auction,
- Provides techniques for disposing of vehicles abandoned in garages,
- Provides means for disposing to demolishers of abandoned or other junk vehicles, the title of which is faulty, lost, destroyed, or otherwise absent, and
- Places certain duties on demolishers with respect to record keeping and the surrender of certificates of title and acceptable substitute documents.

The Council's Suggested State Legislation, although excellent in most respects, could be improved by the following changes:

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[1] This Suggested State Legislation is also available as Appendix B of Motor Vehicle Abandonment in U.S. Urban Areas, by Gardner F. Derrickson, U.S. Department of Commerce, March, 1967; and, as Appendix III of Junk Car Disposal, National Industrial Pollution Control Council, October, 1970. Both of these studies can be purchased from the U.S. Government Printing Office, Washington, D. C., for 35 and 40 cents, respectively.

- The definition of abandoned motor vehicles (in Section 1) should be expanded to include motor vehicles left unattended on public property for more than (forty-eight) hours which either (a) are more than (eight) years old and lack indicia of current official registration, or (b) regardless of age, are substantially stripped of parts essential to operability. Such vehicles should be presumed abandoned. Failure to include them in the definition would hinder the police in handling such vehicles, unless some other legislation on the books provided the necessary authority.

- The definition of demolisher (in Section 1) should be expanded to include any person whose business is to purchase dismantled or other motor vehicles ready for processing into scrap, from wreckers, dismantlers, or other persons in order to resell them to scrap processors. This type of operation, which may include flattening the vehicles and transporting them, has been growing in recent years with the great increase in the number of scrap shredders, which often service areas as far as several hundred miles away. It should, therefore, be included in the definition of demolisher.

- Section 6e should be expanded to also permit issuance of a certificate of authority to dispose to a demolisher without certificate of title and without notification procedures of Section 3 if the motor vehicle, regardless of age, has a fair market value of less than (fifty) dollars. Although Section 6e now provides for accelerated disposal of inoperable, more-than-(eight)-year-old vehicles to demolishers, it fails to cover a substantial number of vehicles of lesser age which have nevertheless been substantially stripped of parts essential to operability and have too little value left to merit the more burdensome notification and impounding procedures established to protect property rights in motor vehicles of more substantial value.

- Section 6e should be expanded further to require that a certificate of authority be issued to cover each transaction authorized therein, as has been done for the transactions covered in Section 6d. This would achieve the objective that every transfer of a junk car to a demolisher would be covered by an authorized document, which would be available for ultimate surrender to the appropriate public agency as desired. This would permit better control over junk car transfers, reducing the possibility of fraudulent transactions. It would also provide a better protection to demolishers, and permit them to accept vehicles that they might otherwise be afraid to accept.

- Section 7a should be expanded to specifically include certificates of authority among the documents that the demolisher shall receive and subsequently surrender for cancellation. This section shall also be further expanded to permit the certificates of title, certificates of authority, and auction sales receipts to be passed from one demolisher to another until the final stage of demolition has been reached. To facilitate transfers of abandoned and other junk vehicles, it is desirable to provide documentation to accompany every transfer of such vehicles, and to list all instruments which may be accepted by demolishers. Because the demolition of a junk motor vehicle may involve the operation of two or three successive operators (the auto wrecker, the scrap processor, and, sometimes, a dealer who transports junk vehicles from the auto wrecker or other sources to the scrap processor), it is important to indicate clearly that no new certificate of title need be obtained anywhere along this chain, but the same certificate of title, certificate of authority, or auction sales receipt may be passed along with the vehicle from demolisher to demolisher until the vehicle is no longer identifiable as such.

- The Act should also provide that the recognition given to certificates of title in effecting the transfer of abandoned and other junk vehicles also be accorded to other types of documents used to effect the transfer of ownership of motor vehicles registered in states which either do not provide for the issuance of certificates of title, or do not provide for the assignment of certificates of title to effect the transfer of vehicle ownership.

(3) Urban Vehicle Collection Practices

Larger cities with major abandoned auto problems have successfully negotiated competitive contracts to collect vehicles designated by Police. Enabling legislation may be required, and in any event is desirable, to permit such contracting. The contracts generally include the following features:

- Contractor must remove the vehicle within a prescribed time following notification (e. g. , 48 hours)
- The contractor is required to store the vehicle for some minimum period while a search for the owner takes place (except where notification is not required)
- If the vehicle is claimed, the contractor may charge for towing and storage (limits prescribed)
- If unclaimed, the vehicle becomes the property of the contractor
- For the above process, the contractor agrees to handle all vehicles designated (with some minimum, if required) for the salvage value of the vehicle, or, when necessary for an additional fixed fee per vehicle or total contract price.

(4) Rural Vehicle Collection

State legislation including the following feature is recommended (comparable to the Vermont approach).

- Counties to collect some minimum number (e. g. , 200) of vehicle hulks in a single location, the state to subsidize the counties administrative costs to some level (e.g., 75%)

- State to hire collector on a competitive basis to remove collected hulks and transport them to a scrap processor
- State to provide technical assistance to the counties in operating the program.

APPENDIX A

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15. Disposal of Junked and Abandoned Motor Vehicles Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U.S. Senate, 91st Congress, 2nd Session on S. 4197, To encourage states to establish junked motor vehicle disposal programs, and for other purposes; and S. 4204, to provide for the efficient disposal and recycling of motor vehicles, and for other purposes, 8/19 and 26/70.

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20. Chindgren, C. I., Dean, K. C. and Sterner, J. W., "Construction and Testing of a Junk Auto Incinerator," Bureau of Mines Solid Waste Program, Technical Progress Report - 21, February 1970.

21. Institute of Scrap Iron and Steel, Inc., "The Economics of Scrapping a Car," Washington, D.C. 20006.

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30. U.S. Department of Health, Education, and Welfare, "Automobile Scrapping Processes and Needs for Maryland," 1967.

31. U.S. Department of Health, Education, and Welfare (Bureau of Solid Waste Management), "The Automobile Cycle: An Environmental and Resource Reclamation Problem," Report No. SW-80ts, 1970

Important Trade Associations

- Institute of Scrap Iron and Steel, Inc.
  1729 H Street, N.W.
  Washington, D.C. 20005

- National Auto and Truck Wreckers Association, Inc.
  18 Second Avenue
  San Mateo, California 94401
    Raymond E. Morris, Managing Director
    415/347-4715

- National Association of Secondary Materials Industries

- United States Auto Dismantling Association
  17 Madelane Drive
  Edison, New Jersey 08817
    Frederick P. Billand, Jr., Executive Director
    201/754-4951

Some Trade Journal Publications

- American Metal Market (daily)
  320 Campus Drive
  Somerset, New Jersey 08873

- Industry Week (weekly)
  The Penton Building
  1213 West Third Street
  Cleveland, Ohio 44113

- Iron Age (weekly)
  56th and Chestnut Streets
  Philadelphia, Pennsylvania 19139

- Waste Trade Journal (weekly)
  130 West 42nd Street
  New York, New York 10036

- Scrap Age (monthly)
  6311 Gross Point Road
  Niles, Illinois 60048

- Secondary Raw Materials (monthly)
  156 Fifth Avenue
  New York, New York 10010

- 33 Magazine (monthly)
  24 Commerce Street
  Newark, New Jersey 07102

- Auto Wrecker (monthly)
  7454 Union Avenue
  Jenison, Michigan

APPENDIX B(1)

AUTO WRECKER INDUSTRY SURVEY

1. WHAT WAS YOUR VEHICLE INVENTORY AT THE END OF EACH YEAR LISTED BELOW?

	1965	1966	1967	1968	1969	1970	
NO. OF VEHICLES							WHAT IS THE SOURCE OF THESE NUMBERS? ☐ ESTIMATE ☐ RECORDS

2. WHAT NUMBER OF VEHICLES DID YOU ACQUIRE DURING EACH OF THE YEARS LISTED BELOW?

	1965	1966	1967	1968	1969	1970	
NO. OF VEHICLES							WHAT IS THE SOURCE OF THESE NUMBERS? ☐ ESTIMATE ☐ RECORDS

3. WHAT NUMBER STRIPPED HULKS DID YOU DISPOSE OF DURING THE YEARS LISTED BELOW?

NO. OF VEHICLES	1965	1966	1967	1968	1969	1970	WHAT IS THE SOURCE OF THESE NUMBERS?
TO INDEP. COLLECTOR							☐ ESTIMATE ☐ RECORDS
TO SCRAP PROCESSOR							TYPE OF SCRAP PROCESSOR
OTHER							☐ BALER ☐ SHREDDER ☐ SLABBER ☐ NOT KNOWN

4. WHAT PERCENTAGE OF YOUR VEHICLES WERE TOWED IN AND DRIVEN IN?

_______ % TOWED _______ % DRIVEN

5. WHAT IS THE AVERAGE LENGTH OF TIME YOU KEEP A VEHICLE BEFORE DISPOSING OF THE HULK? ______________________________

6. WHAT PERCENTAGE OF YOUR VEHICLES COME FROM THE FOLLOWING SOURCES?

_______ % INDIVIDUAL OWNER _______ % NEW/USED AUTO/TRUCK DEALERS

_______ % INSURANCE CO./SALVAGE POOL _______ % STATE/LOCAL GOV'T.

_______ % OTHER (PLEASE DESCRIBE) ______________________________

ARE THESE PERCENTAGES ESTIMATES OR BASED ON YOUR RECORDS? ☐ ESTIMATE ☐ RECORDS

7. HOW DO YOU PREPARE VEHICLES STRIPPED OF SALEABLE PARTS FOR DISPOSAL?

☐ HAND STRIP ☐ BURN ☐ BOTH ☐ AS IS

8. IS THERE A RESTRICTION ON OPEN BURNING IN YOUR COMMUNITY? ☐ YES ☐ NO

IF YES, DOES IT AFFECT YOUR ABILITY TO DISPOSE OF STRIPPED HULKS? ☐ YES ☐ NO

9. WHAT IS THE DISTANCE TO THE SCRAP PROCESSOR WHO PURCHASES YOUR AUTO HULKS? _______ MILES DOES THE PRICE YOU RECEIVE FOR THE HULKS COVER YOUR PREPARATION AND TRANSPORTATION COSTS? ☐ YES ☐ NO

10. WHAT PRICE WAS PAID TO YOU FOR A STRIPPED HULK DURING THE FOLLOWING YEARS?

PRICE	1965	1966	1967	1968	1969	1970	
HI							WHAT IS THE SOURCE OF THESE PRICES?
LO							☐ ESTIMATE
AVG							☐ RECORDS

AUTO WRECKER INDUSTRY SURVEY

11. THE FOLLOWING IS A LIST OF ITEMS THAT MAY CAUSE YOU DIFFICULTIES IN DISPOSING OF YOUR STRIPPED VEHICLES. PLEASE RANK THOSE THAT APPLY BY NUMBERING THEM; 1 FOR CAUSING THE GREATEST DIFFICULTY; 2 FOR CAUSING THE NEXT GREATEST DIFFICULTY, ETC.

_____ TITLING LAWS

_____ BAN (IF ANY) ON OPEN BURNING

_____ PRICE PAID TO YOU BY COLLECTOR/PROCESSOR

_____ TRANSPORTATION COSTS TO SCRAP PROCESSOR

_____ DISTANCE TO SCRAP PROCESSOR

_____ COLLECTOR/PROCESSOR PREPARATION SPECIFICATIONS

_____ COST OF HAND STRIPPING

_____ OTHER (PLEASE DESCRIBE)

____

____

12. WHAT APPROXIMATE PERCENTAGE OF YOUR GROSS SALES HAS BEEN IN THE FOLLOWING AREAS DURING THE PERIOD 1965-1970?

_____ % STRIPPED AUTO HULKS

_____ % USED AUTO PARTS

_____ % OTHER SCRAP

13. WHAT IS THE AVERAGE AGE OF THE HULKS YOU DISPOSE OF? _____ YEARS

14. YOUR BUSINESS LOCATION

CITY

STATE

15. WHICH OF THE FOLLOWING MOST INFLUENCES YOUR DECISION TO DISPOSE OF A STRIPPED HULK?

☐ AGE ☐ LACK OF SPACE ☐ INVENTORY TAX OR FINE ☐ PRICE OF SCRAP

☐ LOCAL ORDINANCE ☐ OTHER (PLEASE EXPLAIN) _____________________

16. DO YOU HAVE ANY OTHER PROBLEMS IN DISPOSING OF YOUR STRIPPED HULKS NOT COVERED BY THE ABOVE QUESTIONS?

17. DO YOU HAVE ANY SUGGESTIONS ON HOW TO REMOVE ABANDONED AUTOS FROM YOUR COMMUNITY?

APPENDIX B(3)

Auto Wrecker Industry Survey Results

Disposal Data - Questions 1, 2 & 3

Year	# Using Independent Collector	Responded But Did Not Use Independent Collector	No Response	Total # Vehicles	Average # Vehicles
1965	18	37	47	8,873	492.94
1966	16	33	53	6,805	425.31
1967	19	30	53	8,041	423.21
1968	26	23	53	11,425	439.32
1969	28	16	58	13,589	485.32
1970	34	12	56	17,294	508.65

Type of Processor Collecting Hulks From Auto Wrecker - Question 3

# Wreckers	Type of Processor
27	Baler
21	Shredder
8	Slabber
7	Not Known
8	Baler and Shredder
3	Baler and Slabber
1	Slabber and Shredder
27	No Response
102	

Incoming Vehicle Condition - Question 4

#Wreckers	% Vehicles Towed In
97	Responded
5	No Response

Average % Vehicles Towed In = 92.32%

Acquisition Age - Question 5 & 13
Average disposal age - average length of time held = average acquisition age = 5 years
93 of 102 Respondents Answering

Vehicle Sources - Question 6

Individual owner	15.4%
Insurance Co.	56.4%
New/Used Auto Dealers	10.8%
State/Local Gov't.	1.9%
Other	15.5%

102 Respondents Answering

Preparation Data - Question 7

# Wreckers	Preparation
1	No Response
41	Hand Strip
7	Burn
8	Both
36	As Is
2	As Is and Hand Strip
7	As Is and Burn
0	As Is and Both
102	

Factors in Disposal Decision

#Wreckers	Burning Restriction
97	Yes
4	No
1	No Response
102	

Open Burning Restrictions - Question 8

#Wreckers	Open Burn Restrictions Affect Disposal
50	Yes
43	No
9	No Response
102	

Hulk Price Data - Question 9

	Scrap Price Cover Trans. & Prep. Costs	Average Distance to Scrap Processor		
		No Response	Response	
			#of Wreckers	Distance (Miles)
No Response	12	7	5	54
Yes	29	1	28	75.14
No	58	0	58	60
Sometimes	3	0	3	15

Disposal Difficulty Ranking - Question 11

(% of Persons Answering)

Priority	Titling	Ban On Burning	Scrap Price	Trans. Cost	Dist. to Scrap Processor	Prep. Reqmts.	Cost of Hand Strip	Other
1	15	18	37	14	2	3	8	3
2	3	13	16	21	8	10	27	2
3	1	8	28	19	13	14	13	4
4	8	15	9	21	13	17	17	0
5	10	10	8	18	21	23	8	2
6	15	26	4	4	30	7	14	0
7	52	19	5	0	10	10	4	0
8	100	0	0	0	0	0	0	0

Sales Data - Question 12

Average % Gross Sales in Used Auto Parts:

Average = 85.84%

95 of 102 Respondants Answering

Average % Gross Sales in Scrap:

Average stripped hulks = 5.16%

Other scrap = 9.00%

95 of 102 Respondents Answering

Disposal Age - Question 13

Average Age of Vehicles Disposed = 6.36 Years

93 of 102 Respondants Answering

Factors in Disposal Decision - Question 15

#Wreckers		Greatest Influence Decision to Dispose of Hulks
Yes	No	
32	70	Age
75	27	Lack of Space
2	100	Inventory Tax of Fine
18	84	Price of Scrap
1	101	Local Ordinance
23	79	Other

30 Checked	2 Factors
9 Checked	3 Factors
1 Checked	0 Factors

SURVEY OF SCRAP PROCESSING INDUSTRY

1. **WHAT EQUIPMENT ARE YOU CURRENTLY USING TO PROCESS AUTO HULKS? PLEASE LIST THE TYPE AND NUMBER OF EQUIPMENT AND THE MANUFACTURERS NAME AND MODEL NUMBER.**

2. **DO YOU HAVE A MOBILE CAR FLATTENER? ☐YES ☐NO IF YES, WHAT IS THE MAXIMUM DISTANCE FROM YOUR PLACE OF BUSINESS THAT YOU CAN TRANSPORT AND OPERATE THE FLATTENER PROFITABLY?____MILES. WHAT NUMBER OF CARS PER EIGHT HOUR DAY MUST BE PROCESSED BY THE FLATTENER AT THIS DISTANCE? _____ CARS/8 HR.**

3. **WHAT PERCENTAGE RANGE OF AUTO SCRAP IS CONTAINED IN THE FOLLOWING GRADES OF SCRAP?**

No. 2 HEAVY MELTING STEEL___ TO___ %

No. 2 BUNDLES____TO___ %

FOUNDRY STEEL SCRAP____TO____ %

SHREDDED SCRAP____TO___ %

4. **DOES THE COMMUNITY IN WHICH YOUR BUSINESS IS LOCATED HAVE RESTRICTIONS ON OPEN BURNING? ☐YES ☐NO IF YES, DO YOU HAND STRIP ☐, INCINERATE ☐, REQUIRE AUTO WRECKER TO INCINERATE ☐ OR HAND STRIP ☐ ?** *(X Those Applicable)*

5. **THE FOLLOWING IS A LIST OF FACTORS THAT MAY AFFECT THE SALE OF YOUR PRODUCT TO A MILL AND/OR FOUNDRY. PLEASE RANK THESE FACTORS BY NUMBERING THEM; 1 FOR CAUSING THE GREATEST PROBLEM IN SELLING YOUR PRODUCT; 2 FOR CAUSING THE NEXT GREATEST PROBLEM, ETC.**

________ BAN ON OPEN BURNING

________ TRANSPORTATION COSTS TO MILL/FOUNDRY

________ DELAY IN RR SCHEDULES

________ SELLING PRICE OF SCRAP

________ SHORTAGE OF GONDOLAS

________ MILL/FOUNDRY RESTRICTIONS ON NONFERROUS CONTAMINANTS

________ INSUFFICIENT SUPPLY OF AUTO HULKS

________ TITLING

________ OTHER (PLEASE EXPLAIN)

____

____

6. **DO YOU HAVE ANY RECOMMENDATIONS ON HOW TO INCREASE THE FLOW OF AUTO HULKS TO AND FROM THE SCRAP PROCESSING INDUSTRY?**

Scrap Processing Industry Survey Results

Equipment Information - Question 1

# Scrap Processors	Equipment
105	Baler
5	Baler and Shredder
69	Baler and Shear
1	Baler, Shredder, and Shear
29	Shredder
31	Shear
3	Shredder and Shear
23	Other
31	None
25	No Response
322	

Mobile Flattener Information - Question 2

# Scrap Processors	Have Mobile Flattener
28	Yes
287	No
7	No Response
322 = # Scrap Processors who Process Auto Hulks	

Maximum Profitable Distance to Collect Hulks	Maximum Distance = X
8	$0 \leqslant X \leqslant 50$
9	$50 < X \leqslant 100$
2	$100 < X \leqslant 150$
1	$150 < X \leqslant 200$
1	$200 < X \leqslant 300$
1	$300 < X$
6	No Response
28	

Restriction Information - Question 4

# Scrap Processors	Restrictions on Open Burning
315	Yes
6	No
1	No Response
322	

Difficulty in Moving Scrap - Question 5

		1*	2*	3*	4*	5*	6*	7*	8*	9*	No Response
P	1	90	31	1	152	4	19	15	3	4	3
R	2	48	97	5	90	10	23	18	5	8	18
I	3	52	57	7	34	20	54	18	2	6	72
O	4	21	31	19	10	36	35	17	13	2	138
R	5	16	12	20	5	36	16	13	8	4	192
I	6	5	-	31	1	17	18	11	8	1	230
T	7	3	3	20	1	11	6	17	12	1	248
Y	8	2	2	4	-	2	3	9	21	-	279
	9	1	-	1	-	1	-	2	-	1	316

* Factors

1. Ban on opening burning
2. Transportation costs
3. Delay in RR schedules
4. Selling price of scrap
5. Shortage of gandolas
6. Mill/Foundry restrictions on nonferrous contaminants
7. Insufficient supply of hulks
8. Titling
9. Other

Distance Actually Traveled

0 ≤ X ≤ 50	50 < X ≤ 100	100 < X
50	100	200
0	100	125
50	60	999
50	60	150
50	100	300
30	60	ST 1774
50	100	740
30	60	310
ST 310	ST 740	T 2824

Average Maximum Distance = 2824/22 ≅ 128.4 miles

Total number of car crushers = 28

Number of shredder or shredder and other equipment combination owning a mobile crusher = 9

Number of shredders or shredders and other equipment combinations = 38

Number of other equipment type operators with mobile crushers = 19

Number of other equipment operators = 284

% of shredder or shredder and other equipment combinations with mobile crushers = 23.65%

% of other equipment operators with mobile crushers = 6.69%

SURVEY OF CITY OFFICIALS FOR ABANDONED AUTOMOBILE DATA

CITY: **STATE:** **PAGE 1**

1. **WHAT ORDINANCES ARE CURRENTLY IN EXISTENCE IN YOUR CITY AND/OR STATE THAT DEAL WITH THE FOLLOWING ASPECTS OF THE ABANDONED AUTO PROBLEM:**

- DEFINITION OF AN ABANDONED AUTO
- REQUEST AND AUTHORIZATION TO REMOVE AN ABANDONED AUTO FROM PRIVATE PROPERTY
- AUTHORIZATION TO REMOVE AN AUTO FROM PUBLIC PROPERTY
- NOTIFICATION TO OWNER THAT HIS VEHICLE WILL BE AND/OR IS IMPOUNDED
- DURATION OF IMPOUNDMENT
- OWNER'S LIABILITY FOR COLLECTION/STORAGE OF HIS VEHICLE
- FINE FOR ABANDONMENT
- PRIVATE PROPERTY OWNER'S LIABILITY FOR STORAGE/REMOVAL OF AUTOS ABANDONED ON HIS PROPERTY
- ABANDONED AUTO DISPOSAL METHOD
- NOTIFICATION TO THE OWNER OF DISPOSAL
- TITLING

Please attach a copy of these ordinances whenever possible and any others you deem relevant

2. **WHAT ADDITIONAL ORDINANCES ARE BEING CONSIDERED AND/OR DO YOU CONSIDER DESIRABLE?** ______

______

______

3. **WHO IS RESPONSIBLE FOR THE ABANDONED AUTO PROGRAM?**

☐ **HWY DEPT.** ☐ **SANIT. DEPT.** ☐ **POLICE DEPT.** ☐ **HEALTH DEPT.** ☐ **OTHER (PLEASE DESCRIBE)**

4. **WHO COLLECTS THE ABANDONED AUTOS?**

☐ **HWY DEPT.** ☐ **SANIT. DEPT.** ☐ **POLICE DEPT.** ☐ **HEALTH DEPT.** ☐ **PVT. CONTRACTOR**

IF A PRIVATE CONTRACTOR, WHAT FINANCIAL ARRANGEMENTS HAVE BEEN MADE? ______

______

5. **DOES YOUR CITY PROVIDE A PUBLICALLY OWNED, OR HAVE A CONTRACT WITH A PRIVATELY OWNED SITE WHERE VEHICLE OWNERS MAY BRING THEIR UNWANTED VEHICLES FOR DISPOSAL?** ☐ **YES** ☐ **NO**

6. **WHAT AVERAGE VOLUME OF ABANDONED AUTOS DO YOU HANDLE? ______ PER WEEK, MONTH, OR YEAR** *(Circle One)* PLACE AN **E** FOR ESTIMATES OR AN **A** FOR ACTUAL COUNT AFTER ALL FIGURES.

WHAT IS THE ABANDONMENT RATE? ______ PER WEEK, MONTH, YEAR *(Circle One)*

HAS THIS RATE INCREASED OR DECREASED DURING THE PERIOD 1965-70?

☐ **INCREASED** ☐ **DECREASED** **BY WHAT AMOUNT? ______ %**

SURVEY OF CITY OFFICIALS FOR ABANDONED AUTOMOBILE DATA

7. WHAT DATA IS AVAILABLE ON THE POPULATION OF UNCOLLECTED ABANDONED AUTOMOBILES IN YOUR CITY? *(STATISTICS, STUDIES, COMMUNITY PROGRAMS, ETC.)*

____

____

____

***8. HOW MANY AUTO WRECKING COMPANIES ARE IN YOUR CITY?** ____________

SCRAP PROCESSORS? ____________

9. IF THERE IS A SCRAP PROCESSOR IN YOUR CITY, DOES HE PROVIDE A READY MARKET FOR YOUR JUNKED AUTOS? ☐ **YES** ☐ **NO** **COMMENTS:** ____________

____

10. CITY DATA	SIZE OF CITY SQ MILES	NO. OF PEOPLE	NO. OF VEHICLES	

11. PLEASE CHARACTERIZE THE AREAS WHICH SERVE AS THE PRIMARY SOURCE OF ABANDONED AUTOS

☐ **LOW INCOME HOUSING** ☐ **CITY STREET** ☐ **SUBURBS** ☐ **INDUSTRIAL** ☐ **RESIDENTIAL**

☐ **OTHER (PLEASE DESCRIBE)** ______________________________

12. ANY COMMENTS/RECOMMENDATIONS THAT YOU HAVE OR ABANDONED AUTO PROBLEMS IN YOUR CITY NOT COVERED BY THE QUESTIONS:

____

____

____

____

____

____

____

____

____

____

____

____

____

____

____

* **AUTO WRECKING COMPANIES**-*Those Companies Whose Primary Income Is From The Sale Of Used Auto Parts Not Garages That Provide Towing Services* **SCRAP PROCESSOR**-*Those Companies Involved In Collecting, Processing And Selling Scrap i.e. Balers, Shredders, Shearers.*

City Survey Results

City Survey Results

Laws Dealing with Abandoned Autos - Question 1		**Number of Responses**
Yes - 100%		15
No - 0		
Program Responsibility - Question 3		
Highway Department	0	12
Sanitation Department	17.65	
Police Department	64.75	
Health Department	0	
Other	11.75	
No Response	5.85	
	100.00	
Collection Responsibility - Question 4		
Highway Department	0	12
Sanitation Department	0	
Police Department	12.50	
Health Department	0	
Private Contractor	81.25	
No Response	6.25	
	100.00	
Availability of Disposal Sites - Question 5		
Yes	26.65%	12
No	66.70	
No Response	6.65	
	100.00	
Available Statistics - Questions 6 & 7		
None	73.350	13
Yes	13.325	
No Response	13.325	
	100.00	
Scrap Processor as Available Market - Question 9		
Yes	40.00	11
No	26.67	
Varies	6.66	
No Response	26.67	
	100.00	

City Data - Question 10

City	Size in Square Miles	Population	Vehicle Population
1) Gloucester, Mass.	36	27,000	NR
2) East Cleveland, Ohio	3	41,000	Unknown
3) San Diego, California	NR	NR	NR
4) Oklahoma City, Oklahoma	649	366,381	378,115
5) Riverside, California	80	140,000	75,000
6) Dayton, Ohio	38.2	243,000	369,000
7) Goffstown, New Hampshire	38	10,000	3,500
8) Detroit, Michigan	139.6	1,511,000	2,000,000
9) Penn Hills, Pennsylvania	19.3	62,549	NR
10) Burbank, California	17.1	88,500	NR
11) Orem, Utah	16	27,000	9,000-10,000
12) Norfolk, Virginia	50	307,951	NR
13) New York, New York	NR	NR	NR
14) Anoka, Minnesota	5.5	13,489	5,980
15) Chicago, Illinois	228	3,500,000	1,048,362

Abandonment Sites - Question 11

Low Income Housing	20.00	13
City Streets	28.00	
Suburbs	0	
Industrial	0	
Residential	36.00	
Other	8.00	
No Response	8.00	
	100.00	

SURVEY OF STATE OFFICIALS FOR ABANDONED AUTO DATA

STATE:

1. **PLEASE FURNISH COPIES OF ANY LAWS IN YOUR STATE THAT DEAL WITH ABANDONED AUTOS. IF YOUR STATE OR COMMUNITIES IN YOUR STATE HAVE AN ABANDONED AUTO PROGRAM, PLEASE FURNISH A COPY OF THE PROGRAM.**

2. **WHICH DEPARTMENT IN YOUR STATE GOVERNMENT IS RESPONSIBLE FOR HANDLING THE ABANDONED AUTO PROBLEM?** ____________________

3. **WHO COLLECTS THE AUTOS ABANDONED ON STATE HIGHWAYS?** ☐ STATE POLICE ☐ HWY. DEPT. ☐ HEALTH DEPT. ☐ PVT. CONTRACTOR ☐ OTHER

   Please Describe ____________________

   IF A PVT. CONTRACTOR, WHAT ARRANGEMENTS HAVE BEEN MADE? ____________________

   ____

4. **PLEASE PROVIDE ANY STATISTICS OR ESTIMATES COMPILED FOR YOUR STATE IN THE FOLLOWING AREAS:** *(Please Annotate all Estimates as such)* (1) POPULATION OF ABANDONED AUTOS IN 1965, (2) ABANDONMENT RATE BY YEAR 1965 - 1970, (3) COLLECTION RATE OF ABANDONED AUTOS BY YEAR 1965 - 1970, (4) NUMBER OF AUTO WRECKING COMPANIES*, (5) NUMBER OF SCRAP PROCESSORS.*

5. **DO YOU LICENSE AUTO WRECKERS?** ☐ **YES** ☐ **NO** **SCRAP PROCESSORS?** ☐ **YES** ☐ **NO**

   IF YES TO EITHER OF THE ABOVE, PLEASE DESCRIBE LICENSE REQUIREMENTS:

6. **PLEASE MAKE ANY COMMENTS OR RECOMMENDATIONS THAT YOU HAVE CONCERNING THE ABANDONED AUTO PROBLEM.**

* *Auto wrecking companies – those companies whose primary income is from the sale of used auto parts not garages that provide towing services. Scrap processors – those companies involved in collecting, processing and selling scrap, i.e., balers, shredders, shearers.*

State Survey Results

Program Inofrmation - Question 1

State	Program Type
California	Impounded - sold
Colorado	Impounded - sold
Connecticut	Impounded - sold - fine
Georgia	Impounded - sold
(Guam)	Impounded - sold for junk under $100.00 public auction over $100.00
Idaho	Impounded - sold
Iowa	Impounded - sold - money to treasury or owner
Kansas	Impounded - sold
Maryland	Impounded - sold - bounty
Massachusetts	Impounded - fine - disposed as refuse
Michigan	Impounded - sold
Mississippi	Impounded - sold - money to treasury
Montana	Impounded - sold - fine $25 - $300/ 90 days in jail or both
Nebraska	NR
New Hampshire	NR (enclosure missing)
New Mexico	Impounded - sold
New York	NR (enclosure missing)
North Carolina	Impounded - sold
North Dakota	Impounded - sold
Ohio	Impounded - sold
Oklahoma	Impounded - sold
Oregon	Impounded - sold
South Carolina	Impounded - sold
Tennessee	Impounded and sold
Texas	Impounded - sold
Utah	Impounded - retitled or dismantle permit
Virginia (Proposed)	Transportation subsidy for all cars and sites
Washington	Impound and sell - abandoner responsible for costs
Wyoming	None

Legend
NR - No Response

Program Responsibility - Question 2

State	Program Responsibility
California	Highway Patrol - State Roads
Colorado	State Highway Department - State Police
Connecticut	None
Georgia	Department of Public Safety
(Guam)	(Director of Public Safety)
Idaho	Department of Law Enforcement
Iowa	Department of Public Safety - Motor Vehicle Registration Division
Kansas	Any agency having jurisdiction over abandonment site
Maryland	Motor Vehicle Administration
Massachusetts	State Police - State Highway
Michigan	Vehicle and Watercraft Records Division
Mississippi	Any Law Enforcement Officer
Montana	Any Law Enforcement Officer
Nebraska	Department of Motor Vehicles
New Hampshire	NR (Enclosure missing)
New Mexico	None
New York	Department of Motor Vehicles
North Carolina	State Highway Patrol
North Dakota	None
Ohio	State Patrol - County Sheriff - Chief of Police of municipality None Central
Oklahoma	Department of Public Safety
Oregon	State Police - County Sheriff - Municipality None central
South Carolina	Sheriff Departments - none central
Tennessee	NR
Texas	None
Utah	Motor Vehicle Bus Administration Division of State Tax Commission
Virginia	None overall - Highway Dept. for Highway Beautification Act
Washington	Department of Motor Vehicle Dealer Division
Wyoming	None

Legend
NR - No Response

Collection Responsibility - Question 3

State	Collectors
California	State Police
Colorado	State and local Police
Connecticut	Private Contractor - authorized by State Police
Georgia	State Police - Auto wreckers authorized by State Police
(Guam)	(Police or Private Contractor)
Idaho	Wrecker
Iowa	Private Contractor under supervision of police
Kansas	State - Highway Commission Other - whoever has jurisdiction
Maryland	Private Contractor - authorized by State and local police
Massachusetts	State Police
Michigan	Wreckers - authorized by local police
Mississippi	Anyone with written request from police
Montana	Police or Private Contractor
Nebraska	NR
New Hampshire	Private Contractor
New Mexico	Private Contractor - Authorized by State Police
New York	None
North Carolina	State Police and Private Contractor
North Dakota	Highway Department and Private Contractor
Ohio	Other - Anyone equipped to tow and store
Oklahoma	State Police
Oregon	State Police and Private Contractor
South Carolina	Sheriff Departments - None Central
Tennessee	NR
Texas	Wreckers authorized by State Police
Utah	Any Law Enforcement Agency in State (Other)
Virginia	Private Contractor through State Police
Washington	Private Contractor - Bonded wreckers and haulers
Wyoming	"Not Applicable"

Legend
NR - No Response

Available Statistics - Question 4

State	Population of Abandoned Autos in 1965	Abandonment Rate by Year 1965 - 1970	Collection Rate of Abandoned Autos by Year 1965 - 1970	Number of Auto Wrecking Companies	Number of Scrap Processors
California	NA	Incr.	66 67 68 15K 16K 17K	2,183	8 Shred.
Colorado	NA	NA	10,200(71)	NR	NR
Connecticut	NA	NA	NA	192	NA
Georgia	UNK	UNK	UNK	UNK	UNK
(Guam)	(NR)	(NR)	(NR)	(NR)	(NR)
Idaho	NA	NA	NA	NA	NA
Iowa	NA	NA	68 69 70 71 1932/2837/3969/3497	NA	NA
Kansas	NR	NR	NR	700	50
Maryland	NA	NA	NA	316	16
Massachusetts	NA	NA	NA	NA	NA
Michigan	36,000	Incr.	UNK	250	UNK
Mississippi	NA	NA	NA	NA	NA
Montana	NA	NA	NA	NA	NA
Nebraska	NR	NR	NR	NR	NR
New Hampshire	NA	NA	NA	NA	NA
New Mexico	NR	NR	NR	158	NR
New York	NA	NA	NA	NA	NA
North Carolina	NA	Incr.	NA	NA	5-6
North Dakota	NA	NA	NA	NA	NA
Ohio	UNK	UNK	UNK	400	25
Oklahoma	NR	NR	NR	NR	NR
Oregon	NA	NA	NA	346	NA
South Carolina	NA	NA	NA	NA	NA
Tennessee	NR	NR	NR	NR	NR
Texas	NA	NA	NA	2,000	NR
Utah	4,555	Steady	15,445 (Collected - total)	150	5
Virginia	133,000		NA	NA	NA
Washington	200,000 Est.	Incr.		705*	20
Wyoming	NA	NA	NA	NA	NA

Legend

NA - Not Available
NR - No Response
UNK - Unknown
INCR - Increasing

*Includes 295 Bonded Auto Wreckers and 60 Haulers

Licensing Information - Question 5

State	License Wreckers	License Scrap Processors
California	No	No
Colorado	No	No
Connecticut	Yes	No
Georgia	Yes	Yes
(Guam)	(NR)	(NR)
Idaho	No	No
Iowa	No	No
Kansas	Yes	Yes
Maryland	Yes	Yes
Massachusetts	No	No
Michigan	Yes	No
Mississippi	NA	NA
Montana	No	No
Nebraska	NR	NR
New Hampshire	Yes	No
New Mexico	Yes	No
New York	No	No
North Carolina	No	No
North Dakota	No	NR
Ohio	Yes	Yes
Oklahoma	No	NR
Oregon	Yes	No
South Carolina	NR	No
Tennessee	No	No
Texas	No	No
Utah	Yes	Yes
Virginia	No	No
Washington	Yes	Yes
Wyoming	No	No

Legend
NA - Not Available
NR - No Response

APPENDIX C

QUANTIFICATION STATISTICAL DATA

The objective in compiling data from various sources inside and outside the scrap steel industry was to obtain:

- An estimate of the number of automobiles which are processed (re-cycled) through the scrap steel industry each year
- An estimate of the flow and inventory at the scrap processing industry
- An estimate of the flow and inventory at the auto wrecking industry
- An estimate of the number of uncollected abandoned automobiles
- Abandonment rate per year.

The estimate of the number of autos processed each year is based on three items:

- No. 2 bundles
- Shredded scrap
- Automotive slab.

The first five tables contain the results of the analysis and reduction of data to yield an estimate of the total number of autos processed each year.

The result of this data analysis consists of a range of estimates of the total tonnage of automotive scrap processed. The number of vehicles processed is estimated by multiplying the number of vehicles per ton of processed scrap by the total tonnage of processed scrap. A flow chart of the data reduction employed to realize the desired result is shown in Figure IV-1. The sources for the data presented in Tables C-1 through C-5 are given in footnotes on these tables.

The following tables show the extrapolation of the number of vehicles processed through the scrap processing industry back to the inflow of vehicles to the auto wrecking industry. Finally, the number of vehicles abandoned per year from 1958 to 1970 is determined. This process is also shown in Figure IV-1.

TABLE C-1
# 2 AND OTHER BUNDLES EXCLUDING # 1
(ALL NUMBERS IN 1000's OF NET TONS)

	1 Year	2 Consumption 1	3 Domestic Receipts 1	4 Dealers Receipts 1
	1958	2997.0	2855.0	2555.0 *
	1959	3840.0	3980.0	3582.0 *
	1960	3980.0	3389.0	3042.0 *
	1061	3569.0	3130.0	2806.0 *
	1962	3484.0	2605.0	2326.0 *
2	1963	5897.0	4708.0	4339.0
2	1964	6486.0	5252.0	4813.0
2	1965	5735.0	5128.0	4581.0
2	1966	5939.0	5319.0	4777.0
2	1967	5354.0	4694.0	4153.0
	1968	4056.0	3610.0 *	3244.0 *
	1969	4270.0	3905.0	3514.0 *
	1970	3917.0	3607.0	3242.0 *

* These values were estimated by using the least squares linear regression method.

1 U.S. Bureau of Mines, Minerals Yearbook (issued annually). 1970 figures are from U.S. Bureau of Mines, Mineral Industry Surveys, "Iron and Steel Scrap".

2 These figures may be high due to possible double reporting by two steel companies. Error controversy in these figures has not been resolved.

TABLE C-2
EXPORTS (ALL NUMBERS IN 1000's OF NET TONS)

1 Year	2 # 2 Bundles Exported [1]	3 # 2 Bundles (Excluding Impurities) Exported [2]	4 Estimated Amt. of Automotive Scrap in # 2 Bundles Exported [3]
1958	410.0	352.6	211.6 - 264.4
1959	817.0	702.6	421.6 - 527.0
1960	1210.0	1040.6	624.4 - 780.4
1961	1679.0	1443.9	866.4 - 1083.0
1962	1105.0	950.3	570.2 - 712.7
1963	1250.0	1075.0	645.0 - 806.2
1964	1642.0	1412.1	847.3 - 1059.1
1965	1450.0	1247.0	748.2 - 935.2
1966	1226.0	1054.4	632.6 - 790.8
1967	1511.0	1299.5	779.7 - 974.6
1968	969.0	833.3	500.0 - 625.0
1969	1038.0	892.7	535.6 - 669.5
1970	1356.0	1166.2	699.7 - 874.6

[1] U.S. Bureau of the Census, U.S. Exports, Schedule B, Commodity and Country, FT 410. 1970 figures are from U.S. Bureau of the Census, Tailor Made Statistics, FT 410, "Iron and Steel Division".

[2] The percentage of impurities (dirt, etc.) in #2 bundles is estimated to be 14% by Mr. William Story. Thus, column 3 = column 2 x .86.

[3] The percentage of automotive scrap in #2 bundles is estimated as being between 60% and 75% by Mr. William Story. And, the figures in column 4 are .6 and .75 x column 3.

TABLE C-3
# 2 BUNDLES (DEALERS' RECEIPTS)
(ALL NUMBERS IN 1000's OF NET TONS)

1 Year	2 Amount # 2 Bundles in # 2 & Other Bundles, Excl. # 1, Dealers' Receipts 1	3 # 2 Bundles (Excluding Impurities) Dealers' Rec. 2	4 % Auto Scrap In # 2 Bundles Dealers' Receipts 3
1958	2299.5	1977.6	1186.5 - 1483.2
1959	3223.8	2772.5	1663.5 - 2079.4
1960	2737.8	2354.5	1412.7 - 1765.9
1961	2525.4	2171.8	1303.1 - 1628.9
1962	2093.4	1800.3	1080.2 - 1350.2
1963	3905.1	3358.4	2015.0 - 2518.8
1964	4331.7	3725.3	2235.2 - 2793.9
1965	4122.9	3545.7	2127.4 - 2659.3
1966	4299.3	3697.4	2218.4 - 2773.0
1967	3737.7	3214.4	1928.7 - 2410.8
1968	2919.6	2510.9	1506.5 - 1883.1
1969	3162.6	2719.8	1631.9 - 2039.9
1970	2917.8	2509.3	1505.6 - 1882.0

[1] The tonnage of #2 bundles in the dealers' receipts of #2 and other bundles, excluding #1, is estimated as being 90%. Thus, column 2 is 90% of column 4, Table 1.

[2] The percentage of impurities (dirt, etc.) in #2 bundles is estimated as being 14%. Thus, column 3 = column 2 x .86.

[3] The percentage of automotive scrap in #2 bundles is estimated as being between 60% and 75%. The percentages were obtained from consultation with William Story of the Institute of Scrap Iron and Steel and William Maguess of Luria Brothers.

TABLE C-4
SHREDDED SCRAP AND AUTOMOTIVE SLAB
(ALL NUMBERS IN 1000's OF NET TONS)

Year	Total Tonnage of Shredded Scrap and Automide Slab 1/	Total Tonnage of Shredded Scrap	Total Tonnage of Auto Slab	Range of estimates of the Amount of automotive scrap In auto slab and shredded scrap 2/
1958	200	–	–	140 - 165.0
1959	300	–	–	210 - 247.5
1960	450	–	–	315 - 371.3
1961	750	–	–	525 - 618.8
1962	1000	–	–	700 - 825.0
1963	1500	–	–	1750 - 1237.5
1964	1800	–	–	1260 - 1485.0
1965	–	1100	800	1570 - 1707.5
1966	–	1300	800	1710 - 1872.5
1967	–	1500	800	1850 - 2037.5
1968	–	1700	800	1990 - 2202.5
1969	–	2059	800	2241.3 - 2498.7
1970	–	2006	800	2202.2 - 2454.9

1/ These tonnages not reported separately during 1958-1964. These estimates were made on the basis of consultation with experts in the scrap processing industry.

2/ The low estimate in Column 5 is 70 percent of Column 2 for 1958-1964. For the period 1965-1970, Column 5 is 70 percent of Column 3 and 100 percent of Column 4.

The high estimate in Column 5 is 82.5 percent of Column 2 for 1958-1964. For the period 1965-1970 Column 5 is 82.5 percent of Column 3 and 100 percent of Column 4.

The 70 and 100 percent estimates were obtained through consultation with personnel in the scrap processing industry. The 82.5 percent estimate was obtained from a Bureau of Mines survey of 9 shredders.

TABLE C-5
(ALL NUMBERS IN 1000's OF NET TONS)

	1		2		3		4		5	
	Range of Estimates of the Tonnage of Automotive Scrap in Dealers' Receipts of # 2 Bundles (Excluding Impurities)		Range of Estimates of Tonnage of Automotive Scrap in # 2 Bundles Exported (Excluding Impurities)		Range of Estimates of Tonnage of Automotive Scrap in Shredded Scrap		Total of Columns 1, 2, & 3		Range of Estimates of the # of Scrapped Vehicles Processed into # 2 Bundles Automotive Scrap and Shredded Scrap[1]	
Year	Low	High	Low	High	Low	High	Low	High	Low	High
1958	1186.5	1483.2	211.6	264.4	140.0	165.0	1538.1	1912.6	1809.6	2250.2
1059	1663.5	2079.4	421.6	527.0	210.0	247.5	2295.1	2853.8	2700.2	3357.5
1960	1412.7	1765.9	624.4	780.4	315.0	371.3	2352.1	2917.6	2768.2	3432.6
1061	1303.1	1628.9	866.4	1083.0	525.0	618.8	2894.5	3330.6	3404.3	3918.5
1962	1080.2	1350.2	570.2	712.7	700.0	825.0	2350.4	2888.0	2745.2	3397.7
1963	2015.0	2518.8	645.0	806.2	1050.0	1237.5	3710.0	4562.5	4364.8	5367.8
1964	2235.2	2793.9	847.3	1059.1	1260.0	1485.0	4342.4	5338.0	5108.8	6208.2
1965	2127.4	2659.3	748.2	935.2	1570.0	1707.5	4445.6	5302.0	5230.2	6137.8
1966	2218.4	2773.0	632.6	790.8	1710.0	1872.5	4561.1	5436.3	5366.1	6395.8
1967	1928.7	2410.8	779.7	974.6	1850.0	2037.5	4558.3	5422.9	5362.8	6380.0
1968	1506.5	1883.1	500.0	625.0	1990.0	2202.5	3996.5	4710.6	4701.9	5542.0
1969	1631.9	2039.9	535.6	669.5	2241.3	2498.7	4408.8	5208.1	5186.9	6127.3
1970	1505.6	1882.0	699.7	874.6	2202.2	2454.9	4409.5	5211.6	5187.8	6131.4
									53936.8	64646.8

---

[1] The average weight per scrapped vehicle was estimated as being 1700 pounds; and thus the #vehicles per ton of processed scrap steel was computed as 1.1765 (= 2000/1700). And column 5 is 1.1765 x column 4.

Needs further explanation for 1700 pounds

TABLE C-6
SCRAP PROCESSORS' INVENTORY AND INFLOW OF AUTOS
(1000's OF AUTOS)

	1	2	3
Year	**Inventory at End of Year**	**Change of Inventory From Previous Year**	**Inflow of Vehicles Column 2 + Column 5 Table 5**
1958	106.4 - 132.4	–	1809.6 - 2250.2 (Change from previous year unknown)
1959	158.9 - 197.4	+ 52.5 + 65.0	2752.7 - 3422.2
1960	162.8 - 202.0	+ 3.9 + 4.5	2772.1 - 3437.2
1961	200.0 - 230.0	+ 37.2 + 28.0	3441.5 - 3946.5
1962	161.6 - 199.5	- 38.4 - 30.5	2706.8 - 3367.2
1963	256.5 - 315.5	+ 94.9 + 116.0	4459.7 - 5483.8
1964	300.0 - 365.0	+ 43.5 + 49.5	5152.3 - 6257.7
1965	307.5 - 360.5	+ 7.5 - 4.5	5237.7 - 6133.3
1966	315.5 - 375.5	+ 8.0 + 15.0	5374.1 - 6410.8
1967	315.0 - 374.0	- .5 - 1.5	5362.3 - 6378.5
1968	276.5 - 325.5	- 38.5 - 48.5	4663.4 - 5493.5
1969	305.0 - 360.0	+ 28.5 + 34.5	5215.4 - 6161.8
1970	305.1 - - 360.2	+ 0.1 + 0.2	5187.0 - 6127.5

1. Column 1, scrap processors' inventory, was derived by dividing the figures in Column 5, Table 5, by 17. This average yearly inventory of 1/17 the number of vehicles processed was determined by the Bureau of Mines in a survey of 186 processors (see item 2, Appendix A) and verified through interviews of Institute of Scrap Iron and Steel personnel. This average estimate does not portray the dynamics of the processors' business. A dynamic analysis of inventory fluctuation would include such parameters as: scrap demand, utilization, purchase and selling price, availability, demand for steel products, general condition of the economy, transportation costs, and geographic factors. Sufficient data, relatable to automotive scrap, were not available to conduct such an analysis.

TABLE C-7
AUTO WRECKERS' INVENTORY AND INFLOW OF AUTOS
(THOUSANDS OF AUTOS)

	1	2	3
Year	Inventory at End of Year	Change of Inventory From Previous Year	Inflow of Autos Column 2 + Column 3, Table 6
1958	452.0 - 562.5	–	1809.6 - 2250.2 (Change from previous year unknown)
1959	688.1 - 855.5	+ 236.1 + 293.0	2988.8 - 3715.2
1960	693.0 - 859.3	+ 4.9 + 3.8	2777.0 - 3441.0
1961	860.3 - 986.6	+ 167.3 + 127.3	3608.8 - 4073.8
1962	676.7 - 842.8	- 183.6 - 143.8	2523.2 - 3223.4
1963	1114.9 - 1370.9	+ 438.2 + 528.1	4897.9 - 6011.9
1964	1288.0 - 1564.4	+ 173.1 - 193.5	5325.4 - 6451.2
1965	1309.4 - 1533.3	+ 21.4 - 31.1	5259.1 - 6102.2
1966	1343.5 - 1602.7	+ 34.1 + 69.4	5408.2 - 6480.2
1967	1340.5 - 1594.6	- 3.0 - 8.1	5359.3 - 6370.4
1968	1165.8 - 1373.3	- 164.7 - 221.3	4498.7 - 5272.2
1969	1303-8 - 1540.4	+ 130.0 + 167.1	5353.4 - 6328.9
1970	1296.7 - 1531.8	- 7.1 - 8.6	5179.9 - 6118.9

1. Auto workers' inventory was derived by dividing the figures in Column 3, Table 6 by 4. The average inventory of ¼ of the vehicle outflow was determined by the Bureau of Mines survey of 1075 auto wreckers (see Item 2, Appendix A) and a survey of 102 wreckers conducted during this study (see Appendix B). The average estimate does not reflect the dynamics of the auto wrecking industry whose business is primarily in the sale of used parts. A dynamic analysis of inventory and inflow fluctuations would include such parameters as: used-parts demand, transportation costs and geographic factors. Sufficient data to reflect the dynamics of the auto-wrecking industry were not available to conduct such an analysis.

TABLE C-8
UNPROCESSED VEHICLES (1000's OF AUTOS)

1 Year	2 Vehicles Retired	3 Unprocessed Vehicles
1958	2982	1172.4 - 731.8
1959	4349	1648.8 - 991.5
1960	4294	1526.8 - 861.4
1961	4420	1015.7 - 501.5
1962	4682	1936.8 - 1284.3
1963	5319	1054.2 - (48.8)*
1964	5704	595.2 - (504.2)*
1965	6174	943.8 - 36.2
1966	6958	1591.9 - 562.2
1967	6226	863.2 - (154.0)*
1968	6348	1646.1 - 806.0
1969	7460	2273.1 - 1332.7
1970	7500	2312.2 - 1368.6
TOTALS	72416	18180.2 - 7969.2

1. From Ward's Automotive Yearbook

2. Column 1 minus Column 5, Table 5. Includes scrap-process inventory, auto-wrecker inventory, and abandoned uncollected vehicles.

* Indicates negative numbers

TABLE C-9
UNCOLLECTED VEHICLES (1000's OF AUTOS)

Year	1 Column 1, Table 8 Repeated	2 Uncollected Vehicles
1958	2982	1172.4 - 731.8
1959	4349	1360.2 - 633.8
1960	4294	1472.0 - 808.0
1961	4420	811.2 - 346.2
1962	4682	2158.8 - 1458.6
1963	5319	421.1 - (692.9)*
1964	5704	478.6 - (747.2)*
1965	6174	914.9 - 71.8
1966	6958	1549.8 - 477.8
1967	6226	866.7 - (144.4)*
1968	6348	1849.3 - 1075.8
1969	7460	2106.6 - 1131.1
1970	7500	2320.1 - 1381.1

2. Column 1 minus Column 3, Table 7 - Abnormal uncollected vehicles and those exported by private owners, used for artificial reefs and landfills, and stored vehicles. All except abandoned, uncollected are considered negligible.

* Indicates negative numbers

APPENDIX D

ABANDONED AUTOMOBILE STUDY PLAN

A detailed program plan has been developed for conduct of the study of abandoned automobiles. The plan describes how we will:

- Collect and evaluate existing data on abandoned automobiles and related data
- Fill the gaps in existing data
- Quantify the various entities in the auto scrap cycle
- Analyze the data to develop alternate strategies to mitigate the abandoned auto problem.

The plan has been organized in two parts. The first part describes our general approach to the study and the methodologies to be used. The second part presents a PERT type schedule of the time phased steps involved in performing the study.

1. APPROACH

(1) Collection and Evaluation of Existing Data

During the preparation of our proposal we developed a preliminary list of existing literature related to the abandoned automobile problem. This list will be expanded through interviews with at least personnel in the following organizations:

- Illinois Auto Salvage Dealers Association
- Minnesota Auto and Truck Salvage Dealers Association
- Institute of Scrap Iron and Steel
- National Association of Secondary Materials Industries

- National Auto and Truck Wreckers Association
- U.S. Auto Dismantling Association
- Department of the Interior
- Department of Commerce
- Department of Health, Education and Welfare
- Ford Motor Company
- General Motors Corporation.

A bibliography representing data collection to date is included as Attachment 1.

As a tool to establish our data requirements and evaluate the completeness of the data, we plan to develop a logic diagram of the automobile scrap cycle. The logic diagram will show the major steps in the auto scrap cycle and will be carried to sufficient detail to show the alternate processes employed by each of the entities in the scrap cycle. Existing data will be superimposed on this logic diagram to assist in evaluating the validity of the data, and the requirements for additional data. To assist us in evaluating the validity of the data, we will call upon several consultants who have had extensive experience in the auto scrap cycle who are recognized authorities in the field. In addition, we will indicate on the diagram where strategies to mitigate the abandoned auto problem have been implemented or proposed.

The results of this will be a complete bibliography of the studies reviewed, an assessment of the usefulness of each, and the identification of areas where additional data to support the study must be collected.

(2) Development of Survey Forms

Survey forms will be developed to gather additional data. The questions in the survey form will be made as self-explanatory as possible and will employ "yes" or "no" questions to the extent practicable to obtain meaningful data. In addition to the forms, a set of instructions for use by the interviewer during personal interviews will be developed if necessary. For mail interviews a set of instructions will be developed for the respondent where the complexity of the question warrants.

Early in the survey form development, it is wise to contact the Office of Management and Budget (OMB), Office of Statistical Policy, to discuss the ground rules for the development, testing and submission of the survey form, (BOB(OMB)) Form 83 and the Supporting Statement for approval. This meeting was conducted on July 15. No problems are indicated in obtaining form approval and we obtained permission to test the survey form.

Upon finalizing the form and completing BOB(OMB) Form 83 and the Supporting Statement they will be forwarded to EPA for review and approval and subsequent submission to OMB.

(3) Data Collection

Having identified the gaps in existing data we will proceed to contact, as necessary, personnel in:

- State and local Governments
- Auto wrecking industry
- Scrap processing industry

and solicit their assistance during this task. Contact will be made by phone, letter or personal visit as deemed appropriate but the interviews to complete the survey forms will be conducted primarily through the mail. Each of these three groups is described briefly below:

1. State and Local Government Officials

Information sought from State and local Government officials will include the following:

- Present practices

- Strategies to collect and process abandoned autos

- Strategies to prohibit abandonment of autos
- Pollution abatement activities affecting the scrap cycle
- Abandoned automobile population and flow rates.

This segment of the survey will give us insight into typical community handling of abandoned automobiles, both legally and physically, and will indicate the extent to which anti-pollution laws affect the scrap cycle. In addition, we will be able to quantify the abandoned automobile population on a per capita basis.

2. Auto Wrecking Industry

In addition to discussions with the two major automobile wrecking associations (and with their cooperation), we will survey a number of auto wrecking companies in urban and rural communities across the country. For comparison purposes, some of these firms will reside in or near the cities and counties chosen for the State and local Government officials survey. Information will be sought in at least the following areas:

- Abandoned automobile population and flow rates
- Number of out-of-service vehicles and flow rates
- Equipment and its capacity used in processing out-of-service automobiles
- Impact of anti-pollution laws
- Disposal problems.

3. Scrap Processing Industry

We will follow up on the initial contacts with the industry trade associations. Survey forms will probably not be used for data collection in this industry. From the associations, we will compile a total number of scrap processing installations, the number, type and capacities of their equipment and tonnages handled. In addition, we will identify major problems that may exist, including transportation problems, quality problems of processed and incoming scrap, and problems related to anti-pollution laws. We will also quantify that portion of the total scrap consumed that comes from automobile hulks. In quantifying the demand for scrap and determining scrap prices we will also investigate the percentage of scrap exported.

(4) Automobile Scrap Process Model

We will construct a preliminary model of the automobile scrap cycle (first draft enclosed) for use in evaluating the completeness of existing data. As the project proceeds, we will add to the detail of the model the major economic, legal, and technological factors affecting the cycle.

The model (see Attachment 2) is a logic flow diagram showing the out-of-service automobile cycle. The top level breakdown includes the following three major headings:

- Automobile Abandoned
- Automobile Sold to Automobile Wreckers
- Automobiles Sold to Scrap Processor.

Each is traced to the lowest level of quantification possible with the data available. The model shows the various processes which an automobile may go through as it is being recycled, including the legal as well as the physical processes. The economics of each process will also be included in the cycle.

(5) Development of Alternate Strategies

Early in the program we will begin the development of the alternate strategies. The alternate strategies will be derived from three sources:

- Those currently in use in cities/counties
- Those proposed in the literature reviewed
- Those generated as a result of the review and evaluation of existing data and the survey of the various entities in the scrap cycle.

Alternate strategies will be considered for all entities in the scrap process. The strategies may take the form of positive or negative economic incentives, legislation, subsidies, non-interference with the cycle, or any combination of the first three. The strategies will also be a combination of short and long range strategies. The first, to remove the backlog of abandoned automobiles and the second, to preclude their existence in the future.

(6) Data Analysis

Having selected the strategies to be tested, we will next simulate these strategies in the model and observe the short term and long term results. The strategies will be evaluated and ranked based on their effectiveness in mitigating the abandoned auto problem versus the ease and cost of implementation.

(7) Technical Summary

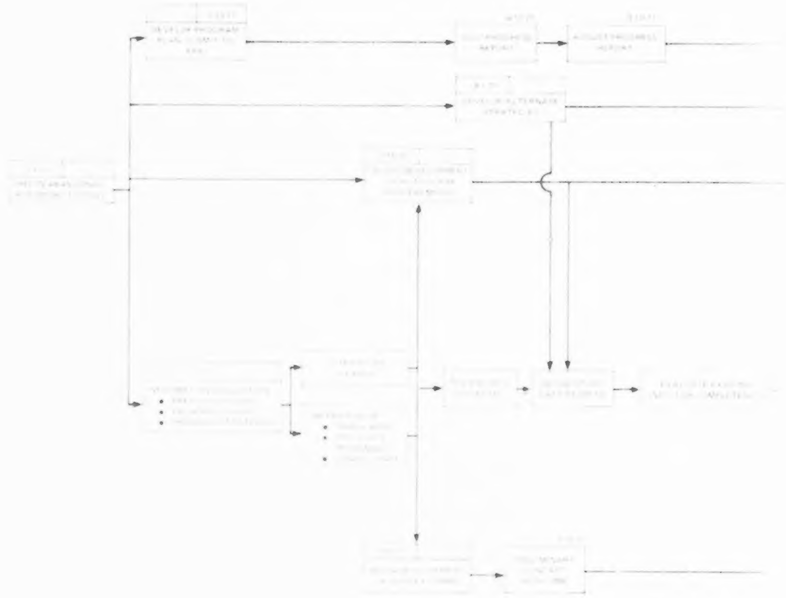
We will document the results of the preceding tasks. A draft of the Technical Summary will be submitted to EPA for their review and approval. The report will contain our study methodology, description of the entities in the automobile cycle, our findings, conclusions and recommendations. We will finalize the Technical Summary upon receipt of approval from EPA. A tentative outline of the Technical Summary is included as Attachment 3.

(8) Model Ordinances

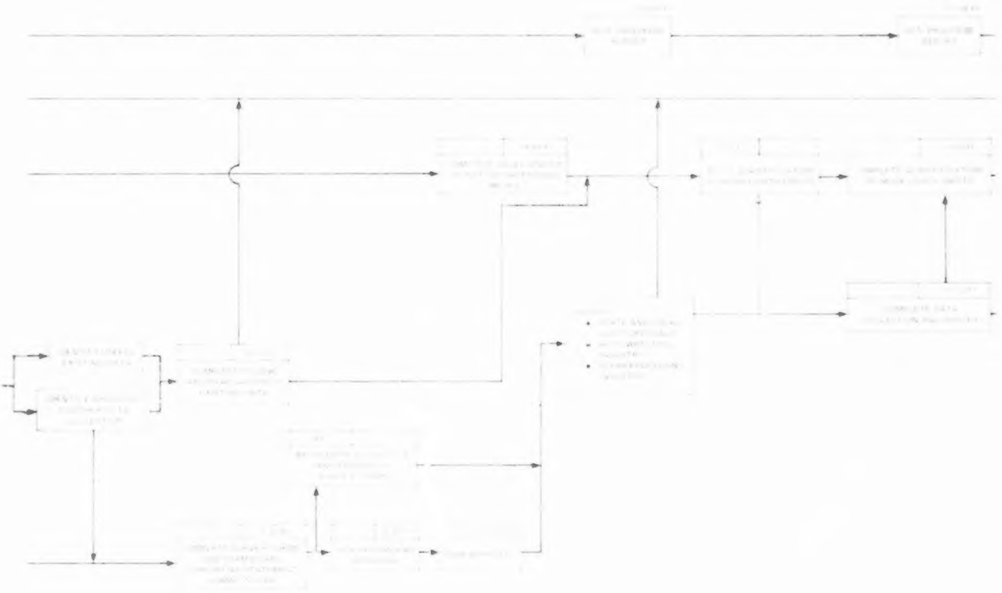
The model ordinances will be prepared in a draft form, forwarded to EPA for their review and approval, and finalized upon receipt of EPA approval. The ordinances will reflect the results of the strategy evaluation and ranking. They will be aimed at rapid and economical abandoned auto removal to improve aesthetics, and maximize utilization through recycling. The ordinances will consider all aspects of the scrap cycle to maintain a competitive environment within each entity. They will also account for the levels at which they will be applied, i. e., Federal, State, local, and therefore will be sufficiently flexible to meet specific needs of various parts of the country.

2. SCHEDULE

The following page represents the time phased steps involved in conducting the study. The major tasks are identified by a three part box with one or two dates inserted in the upper sections. A date at the upper left indicates a "start" date. A date at the upper right indicates a "complete" date. Other boxes represent subtasks.


DEVELOP PROGRAM
DEVELOP ALTERNATE STRATEGIES

ABANDONED AUTO PROGRAM PLAN SCHEDULE


COMPLETE DATA
COLLECTION PROCEDURES

ABANDONED AUTO PROGRAM PLAN SCHEDULE
(Cont.)

ABANDONED AUTO PROGRAM PLAN SCHEDULE
(Cont.)

APPENDIX E

STUDY METHODOLOGY

The study was conducted in two phases. This report represents work done during the first phase which began on July 1, 1971 and was completed on April 1, 1972. The first phase, as shown on Figure E-1, included the following tasks:

- Review and Evaluation of Existing Data
- Scrap Cycle Model Development
- Data Gathering
- Data Analysis and Quantification of the Problem
- Development, Evaluation and Ranking of Strategies.

The second phase ended on June 30, 1972 with the submission of model ordinances dealing with the abandoned auto problem. The detailed program plan is contained in Appendix D.

A discussion of the study methodology for the above mentioned tasks follows.

1. REVIEW AND EVALUATION OF EXISTING DATA

Numerous documents dealing with abandoned autos and the auto scrap cycle, published by Federal, State, and private organizations, were reviewed and evaluated during the course of the study. In addition to the literature search and evaluation, personnel knowledgeable in the area of scrap disposal were interviewed. During these interviews, comments were solicited regarding specific aspects of the general problem, and any additional data pertinent to the study was sought.

2. MODEL DEVELOPMENT

The first step in the model development, was the development of a flow diagram depicting the entities in the auto scrap cycle and their interrelationships. This was accomplished during the review of existing data on the cycle. This static model served as a convenient framework to identify the major entities in the cycle, to show the

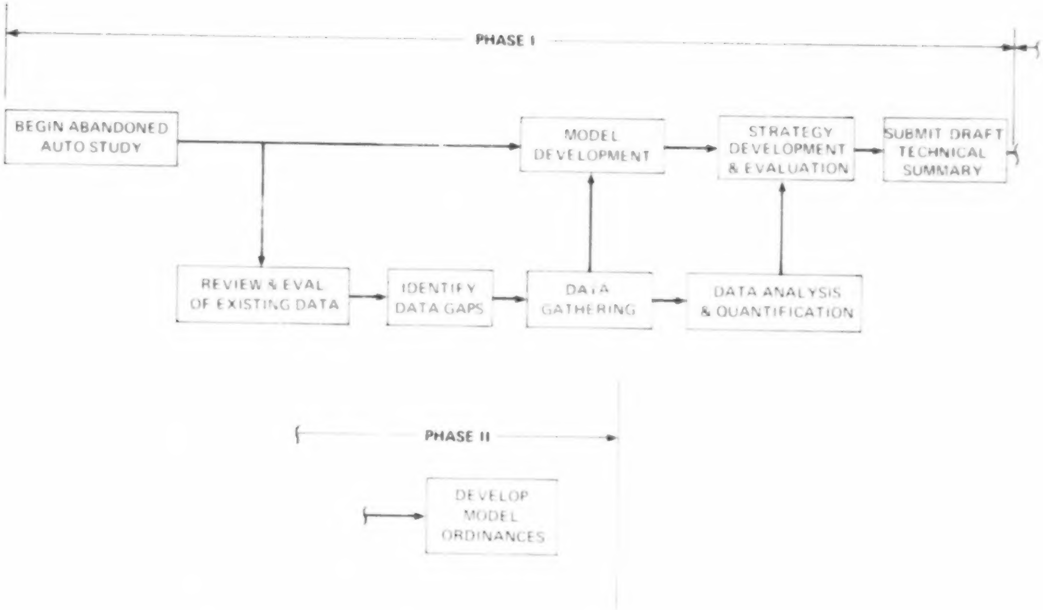

PHASE I
BEGIN ABANDONED AUTO STUDY
MODEL DEVELOPMENT
STRATEGY DEVELOPMENT & EVALUATION
SUBMIT DRAFT TECHNICAL SUMMARY
REVIEW & EVAL OF EXISTING DATA
IDENTIFY DATA GAPS
DATA GATHERING
DATA ANALYSIS & QUANTIFICATION
PHASE II
DEVELOP MODEL ORDINANCES

FIGURE E-1
Abandoned Auto Study Methodology

interrelationships of the entities, and to identify areas where additional quantitative and/or data were needed.

The next step in the model development was the identification and quantification of appropriate input and feedback parameters. It was the intent to develop a mathematical model of the auto scrap cycle that would show the dynamic interrelationships among the entities within the cycle.

By simulating strategies to mitigate the abandoned auto problem through modifications of these input and/or feedback parameters, the optimum strategy or combination of strategies was determined. The review of existing data, the four surveys, and interviews of knowledgeable personnel in the auto scrap industry were used to identify and quantify the appropriate parameters.

3. DATA GATHERING

Due to the large number and geographic dispersion of potential data sources, the state and city government associations and the trade associations of the major entities in the auto scrap cycle were asked to assist in providing information. In consultation with personnel from these associations, questionnaires were developed to provide missing data and/or to verify existing data. Questionnaires were forwarded by four organizations to their members. Each of these is discussed below, together with a summary of personal interviews conducted within each of the categories.

(1) Auto Wrecking Industry

Representatives of the National Auto and Truck Wreckers Association (NATWA) and the United States Auto Dismantlers Association (USADA) were contacted. These two national associations represent approximately one thousand (1,000) direct members and approximately two thousand five hundred (2,500) affiliate members. The questionnaire developed for the Auto Wrecking Industry, as shown in Appendix B, was geared to determine:

- Obsolete vehicle flow rates
- Preparation and disposal practices
- Disposal motivation
- Business characteristics.

The questionnaire was distributed to the direct members of the associations.

In addition to the questionnaire, personnel in, and a consultant to, the Auto Wrecking Industry were interviewed. The purpose of these interviews was to assess their attitudes towards various approaches to the abandoned auto problem. Further, the interviews served to gain additional insight into their business operations.

(2) Scrap Processing Industry

Representatives of the Institute of Scrap Iron and Steel (ISIS) were contacted and they expressed willingness to assist in the data collection effort. ISIS represents 1,200 of the 3,500 scrap processors across the country. Although they represent less than half the total number, the 1,200 account for approximately 95 percent of all scrap processed in the United States. The questionnaire developed for the scrap processing industry was geared to determine:

- Types of processing equipment
- Roadblocks to the flow of scrap
- Processing capacity

and to verify assumptions made in the entity quantification effort. The questionnaire, shown in Appendix B, was distributed to the entire ISIS membership.

In addition to the survey of the ISIS members, a consultant to ISIS and an officer of ISIS were interviewed to obtain further details of the industry's processing capacity and problems confronting the industry in obtaining scrap, processing it, and selling their products to the steel industry.

(3) City Governments

Officials in 30 cities, with populations ranging from 10,000 to 8,000,000 were surveyed through the National League of Cities. A list of cities contacted is contained in Appendix B. The types of data sought were:

- Abandoned auto laws/ordinances
- Abandonment rates
- City characteristics.

The questionnaire developed for city governments was designed to determine the laws/ordinances governing the collection, storage and disposal of abandoned automobiles and the problems encountered during this process. Information regarding the population and the most prevalent geographic sources of abandoned autos was also requested.

City officials were also interviewed to obtain general background information on the extent of their cities' abandoned auto problem and to solicit opinions regarding what they considered effective steps to combat the problem.

(4) State Governments

Officials in all 50 states were surveyed through the Council of State Governments. State governments were chosen as potential data sources because of the increasing interest in, and number of, environmental programs being undertaken at the state level. Further, removal of abandoned autos on state highways is the responsibility of state police and the highway maintenance staff. The types of data sought were:

- Abandoned auto laws
- State abandonment auto programs
- Abandonment rates.

The questionnaire shown in Appendix B, was designed to determine the laws and programs currently in existence that deal with the collection, storage, and disposal of abandoned autos. Information concerning abandonment rate, abandoned auto population, and number of auto wreckers in the state was also sought.

(5) Scrap Users

Existing literature on the scrap processing industry was consulted to determine characteristics of scrap consumers. Specific items sought were:

- Utilization ratio of home scrap to purchased scrap
- Scrap purity requirements
- Preferred grades of scrap
- Consumption of scrap by grades
- Constraints in the use of scrap

Ample literature on scrap utilization made it unnecessary to conduct a survey of the steel and foundry industries.

(6) Additional Data Sources

Personnel in the following Federal agencies were interviewed to obtain information related to the auto scrap cycle:

- Department of Commerce
- Department of the Interior
- Department of Transportation
- Environmental Protection Agency
- Council on Environmental Quality.

In addition to Federal Government personnel, personnel at two major auto manufacturing companies, the American Iron and Steel Institute, and county police were interviewed in the search for additional data and information on the problem.

4. DATA ANALYSIS AND QUANTIFICATION OF THE PROBLEM

A requirement of the study was the quantification of the flow of out-of-service autos through the entities in the auto scrap cycle, and estimation of the number of abandoned autos currently existing and the abandonment rates. This involved the determination of the following data illustrated in Figure III-1:

- The total number of out-of-service autos
- The flow and inventory of autos at auto wrecking and scrap processing yards
- The flow and inventory at insurance companies, new and used car dealer lots
- The number of autos out of the industrial flow.

The number of out-of-service autos is available in Ward's Automotive Yearbook. This information for passenger cars is recorded from 1940 to 1969. The data were derived from state motor vehicle files and tabulated by R. L. Polk and Company.

The number of autos processed through the scrap processing yards and available to scrap users was estimated on the basis of #2 bundles and shredded scrap produced annually. The tonnage of these two scrap grades was converted into equivalent autos by using an average stripped hulk weight. The inventory maintained at scrap processing yards was estimated from previous studies and through consultation with scrap processing industry personnel. The details of this and the following procedure will be found in Appendix C.

The number of uncollected autos, represented by blocks 7 and 9 in Figure III-1, was determined as the remainder of autos not accounted for in the other entities in the scrap cycle. The number is determined by subtracting from the total number of out-of-service autos, the number of autos reaching the steel industry as scrap and the inventories of each entity in the cycle.

In addition to using data from previous studies and the opinions of experts in the auto scrap cycle, the survey results were used to confirm previous study results and/or provide new data for the quantification effort.

Another requirement of the study was that of determining the processing capacity of the auto scrap processing industries. This was accomplished by reviewing existing data and consulting personnel in the auto scrap processing industries.

5. DEVELOPMENT, EVALUATION, AND RANKING OF STRATEGIES

Strategies dealing directly or indirectly with the abandoned auto problem were collected during the course of the study. They represent strategies currently in use at state and local levels and new strategies proposed to alleviate the aesthetic and recycling problems caused by abandoned autos.

In order to judge the impact, effectiveness and potential for acceptance, objectives were developed for initial screening to determine if the strategies were responsive to the basic abandoned auto problem as previously defined. Those that were responsive to the problem were subjected to the entities affected by the strategies, costs involved in implementing the strategies, the impact on the environment, potential for resource reclamation, effectiveness and potential for public acceptance.